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Mining in a Politically Unstable World

AS we look back at the turn of the year, we are reminded that seldom has a year been more fraught with political and economic developments of outstanding importance than 1961. To mention only a few of the major political happenings, the past twelve months have witnessed the induction of President Kennedy as President of the United States; U.N.'s abortive endeavours to unify the Congo by force and the tragic death of Dag Hammarskjold on his way to peace talks with Katanga; South Africa's secession from the Commonwealth; and the interminable succession of discussions and crises whereby the Central African and East African territories are groping painfully but perceptibly towards self-government. In the Far East, India remains at loggerheads with China, while the civil war in Laos and the threat to South Vietnam serve as periodical reminders that the flashpoints are by no means confined to Europe and Africa.

The apparent inability of the Western powers to co-ordinate their policy is in some respects paralleled by the disagreement which appears to have arisen behind the Iron and Bamboo Curtains, where Mr. Khrushchev's policy of co-existence is opposed by both China and Albania, as well as by a minority within Russia itself which is being ruthlessly "destalinised". While it would be unwise, at this stage, to attach too much significance to this apparently widening rift in the Communist lute, there have lately been signs that relations between Moscow and the West may be beginning to thaw.

Economically, the highlights of 1961 included Britain's application for membership of the Common Market and the Inter-American Conference at Punte del Este near Montevideo, which might be described as an all-out attempt to accelerate Latin American development by a truly immense programme of financial and technical assistance, conditional upon self help by the recipients of foreign aid.

The year opened with United States steelworks operating at half capacity, with the credit squeeze in Britain still tending to be shrugged off by investors, with economic activity in Western Europe flattening out at an extremely high level, and with the pace of Japan's phenomenal surge of expansion becoming even hotter. As had been widely anticipated, mid 1961 saw the United States emerging from its relatively shallow trough of recession and the American economy now appears to be heading for record peaks. Meanwhile the British Government's efforts to achieve a favourable balance of payments, if they have not been conspicuously successful in boosting exports, have at any rate been effective in throttling down home demand for durables and hence for metals; steelmakers in the E.C.S.C. are becoming increasingly worried by the twin problems of falling prices and shrinking order books; Japan faced by a rising trade deficit, has been slashing steel export prices, while Japanese steel makers have been asked by the Government to cut back their capital investment programmes in the present financial year by 5 per cent.

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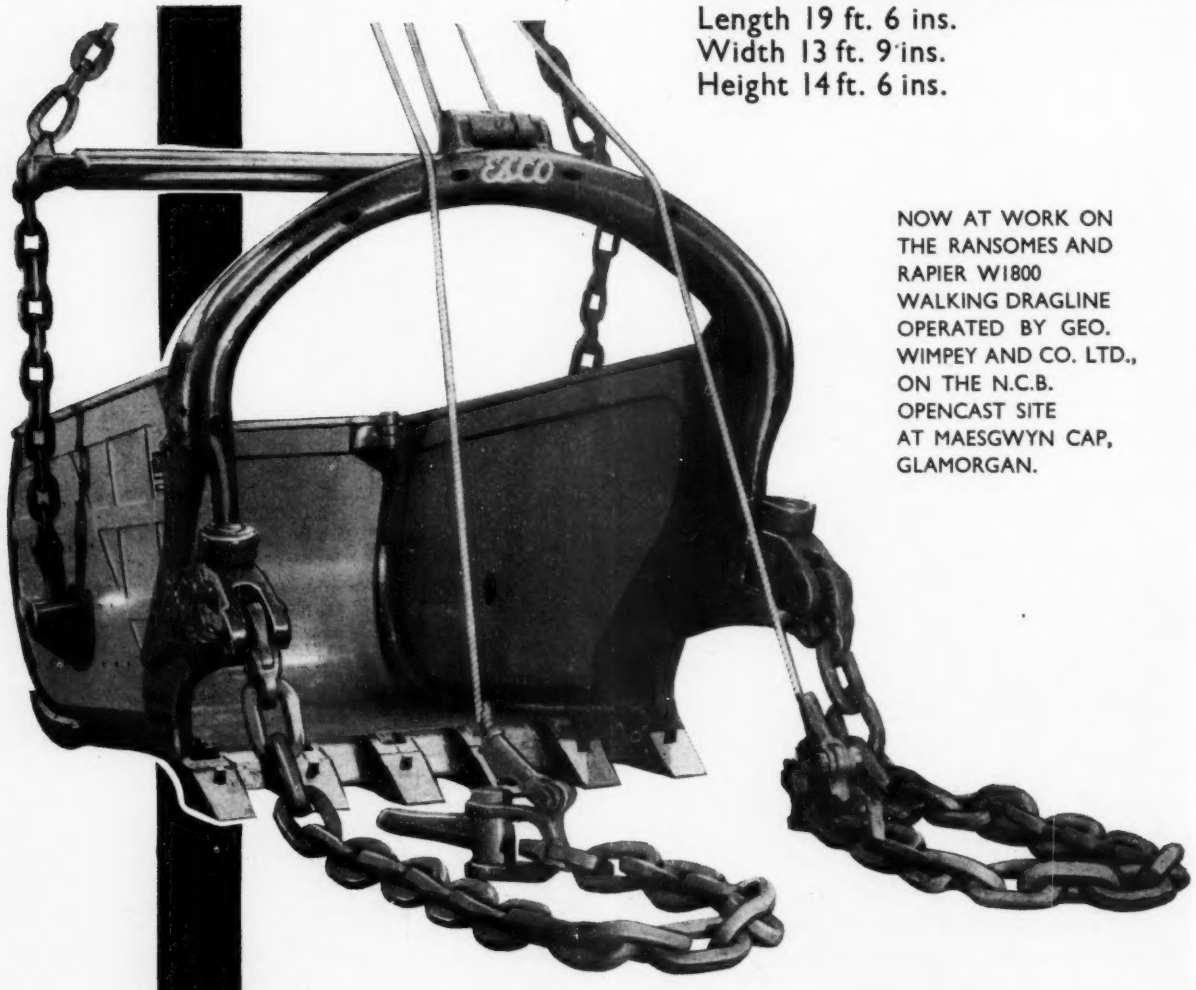

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In the present difficult trading conditions, hopes for an early resumption of expansion are centred mainly on the recovery in the United States, where spending on plant and equipment —stimulated by growing optimism as well as by the stepping up of defence and space research programmes — is now expected to reach $35,840,000,000 during the coming year, an increase of 4 per cent above the indicated level of 1961. The U.S. economy, however, is once again running into balance of payments difficulties, the deficit reaching an annual rate of over $3,000,000,000 in the third quarter of the year. In attempting to plug this drain, the Administration is concentrating in the first place on reducing its overseas military expenditure by persuading Germany and other countries to buy more military equipment in the U.S., and secondly on increasing exports.

At the same time, Washington has continued its efforts to spread the aid burden more widely. At a meeting of the Development Assistance Group held in London during March, a plan was submitted whereby each contributing country would undertake to provide not less than 1 per cent of its gross national product in economic assistance. In this connection it is noteworthy that, taking government and private investment together, approximately 1¼ per cent of Britain's national income (amounting to some £2,500,000,000) has gone to under-developed countries since the war.

The U.S. Administration's proposal envisaged that provision should be made for balance of payments conditions by making "untied" loans at low or nominal rates of interest as a general rule, but allowing countries with payments deficits to tie their aid. A novel feature of the plan was that America's own contributions to the under-developed nations would be dependent on the efforts of the recipient countries to put their own house in order, priority being accorded to those which were prepared to undertake the necessary economic and financial reforms and to formulate realistic development plans.

In the United States itself, President Kennedy's plans for a revolutionary foreign aid programme, involving a new omnibus aid agency with power to draw as much as $4,800,000,000 directly from the Treasury over the next five years for long-term development loans abroad, ran into extremely heavy weather in its passage through Congress, which eventually approved a compromise appropriation of $3,900,000,000.

At a time when the progress of the Free World's economy as a whole was tending to be sideways rather than forwards, fantastic target figures for 1980 were announced by Mr. Khrushchev when he presented the new 20-year economic plan to the Soviet Communist Party's 22nd Congress. Capital investments during this period would total about £800,000,000,000, to raise the gross national product to five times its present level. Mr. Khrushchev promised the Congress that by then Soviet industry would "produce nearly twice as many industrial goods as are now produced in the whole non-Socialist world, including the U.S.A."

The psychological impact of this massive piece of pie in the Communist sky is perhaps at least partially responsible for the U.S. proposal to O.E.C.D. that member countries should aim to increase their joint gross product by 50 per cent over the next decade.

The existence, on both sides of the Iron Curtain, of such ambitious programmes of long-term development can scarcely fail to bring about a corresponding expansion in the demand for metals and minerals, and is particularly encouraging at a time when indices of world commodity prices are hovering at or near record "lows".

So far as both Britain and the United States are concerned, the most intractable problem presented by any programme of sustained expansion is how to keep the ship of state within the narrow channel of economic prudence, without foundering on the shoals of currency crises on the one hand or running aground on the sandbank of depression and under-employment on the other. Once two of the world's strongest currencies, nowadays sterling and the dollar seem to come alternately under strain. By mid-December U.S. gold stocks of $16,925,000,000 had fallen to their lowest level since 1939.

Due largely to Washington's determination to avoid benefiting Russia by any action which would have the effect of raising the price of gold, a variety of expedients for protecting the liquidity of the Free World have been considered. In spring the central banks of nearly all the main Continental countries agreed to collaborate with the Bank of England under the Basle Agreement in suspending normal convertibility arrangements in the interests of the £. At the time it was widely believed that the way had been opened for controlling the problem presented by the shortage of international liquidity. Later in the year proposals were put forward which would have had the effect of converting the I.M.F. into a world central bank, with the creation of an international currency unit to take its place alongside gold. An alternative proposal envisaged the I.M.F. as a lender of last resort, on a much larger scale than present resources allow, to countries whose currencies are under pressure.

In mid-December came a promising step forward when the finance ministers of 10 leading industrial countries agreed in principle at a meeting in Paris to add $6,000,000,000 to the resources of the I.M.F.

In the unsettled conditions of international finance the price of gold has naturally remained extremely firm, though there has been no flare-up such as occurred in the autumn of 1960. The growing belief that an upward adjustment of the dollar price of gold cannot be indefinitely delayed continues to be reflected in the high level of gold mining activity. In South Africa an all time record for monthly production was set up in August with an output of 1,967,016 oz. and it is certain that the 2,000,000 mark will soon be passed. South African gold shares, however, have been depressed by restriction of movement of capital from South Africa following the Republic's decision to leave the Commonwealth. Apart from the effects on sentiment overseas, the blocking of the rand as part of the exchange control restrictions introduced by the South African Government resulted in a heavy discount between the Johannesburg and London stock exchanges. The climate for Kaffirs, however, has latterly taken a marked turn for the better and prices of the financial groups and leading gold mines are now well off the floor.

For silver the year has been a memorable one indeed, for the U.S. Treasury has been obliged to suspend sales from its "free" stock and the price of the metal has reached its highest level for forty years. Since 1946, it has been obligatory for the U.S. Treasury to buy newly-mined silver from producers at 90½c. an ounce and to make silver available to domestic consumers at 91c. per oz. delivered at the San Francisco Mint. The effect of this policy has been to stabilise the price of silver not only in the United States but in the principal open markets of the world. For a number of years world production has remained in the region of 200,000,000 oz., whereas world consumption has risen very steeply since 1955, due partly to a rapidly increasing demand from industry and partly to the return to silver for currency by several European countries.

The rising gap between supply and demand has been bridged by the U.S. Treasury's "free" silver stock, which has been dwindling at a progressively faster rate. By November 29, when the President directed the Treasury to suspend the sale of "free" silver, the stock had fallen to some 26,000,000 oz., as compared with 124,000,000 oz. at the beginning of the year.

The American Government has announced its intention of drawing its future requirements for domestic coinage not from the world market but from the gradual retirement of silver certificates, for which it has some 1,700,000,000 oz. of silver in reserve as backing. The effect will be to relieve the market

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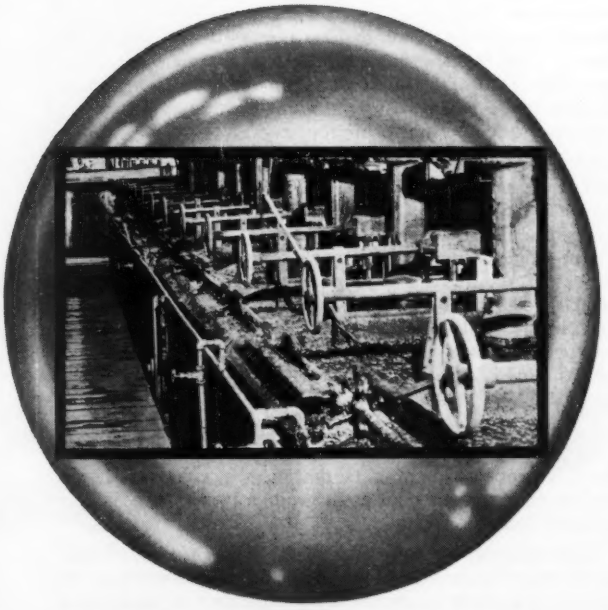

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for an indefinite period of a demand amounting to some 46,000,000 oz. of silver annually. Since the annual deficiency in both 1960 and 1959 has exceeded 115,000,000 oz. this still leaves an uncomfortably large gap to bridge. The outlook is thus for a higher level of prices than in the past decade, though the existence of vast quantities of hoarded silver, especially in the Far East, should act as an effective stabiliser.

Apart from the unsettled conditions in the Congo Republic, the diamond industry has had an excellent year; total sales for the first nine months amounting in value to £69,319,670 compared with £66,295,023 in the same period of 1960, and there appears to be a good chance that the total value of the year's sales will surpass the 1960 record figure of £89,700,383. Gems and industrials are no longer shown separately in the quarterly figures, but it has been reported that, following their spectacular increases in Europe during the three preceding years, sales of industrials gained further ground in the first nine months of 1961.

A notable development during the year was the official opening by Mr. H. F. Oppenheimer, chairman of De Beers Consolidated Mines, of a factory at Springs, near Johannesburg, for the production of synthetic boart. In this venture De Beers are partnered by Beceka, whose mines at Bakwanga in the Congo are the world's largest producers of natural diamond abrasive. Now that both De Beers and General Electric are producing synthetic boart, the development of uses for diamond abrasive will no longer be limited by the availability of natural grit. It appears that the manufacture of synthetic grit may also have been developed in Russia, for a report from Moscow states that the Ukrainian Research Institute of synthetic super-hard materials has produced 2,000 ct. of artificial diamonds.

Prices of a number of base metals have been under pressure throughout much of the year, due not so much to falling consumption as to the existence of considerable excess capacity, a state of affairs which in most instances is likely to continue for some time to come.

A notable exception is tin—the only major metal for which the possibility of a serious physical shortage in the short-term can be foreseen. The inevitability of a deficit during 1961, was widely accepted before the year began. As invariably happens in such a situation, normal buying was augmented by additional forward purchases and speculators were also active. On June 20 — ten days before the expiry of the first International Tin Agreement—the buffer stock was wiped out by a wave of speculative buying. In these circumstances the failure by producers and consumers to agree upon new flooring and ceiling has been of little practical importance as the I.T.C. has ceased since June to exercise any control on the course of the market. Prices have been kept in check, however, by a number of factors such as the sales of U.S. Government's small Texas smelter stocks — now approaching exhaustion — and the hope that Congress may yet give its approval for releases of tin from the national stockpile early in 1962. The strike at the Steel Co. of Wales, a reversal in the downward trend of U.K. stocks and poor Continental demand have been other factors contributing to take the steam out of prices, which after approaching £1,000 a ton have fluctuated, broadly speaking, within limits of £940 and £980. Current indications seem to point to a deficit of 15,000 - 20,000 tons next year.

Copper has displayed remarkable steadiness throughout the year, in spite of such actual or potential interruptions to supplies as were presented by strikes in Chile and the United States, U.N.'s abortive *coup d'etat* in Katanga, and the periodical element of uncertainty created by the constitutional deadlock in Northern Rhodesia. While the undertone of the market remained consistently firm throughout most of 1961, the L.M.E. average has been a few pounds lower than in the previous year, in fact which of course, reflects the continued existence of a large amount of excess capacity.

As a result of this situation, voluntary cutbacks in output or sales had to remain in force throughout the year and a certain amount of influential price support was also required. The statistical position is gradually improving, however, and an encouraging element in the market outlook is the revival of American consumption, which is exceeding earlier hopes.

The position of both lead and zinc has further deteriorated. At its meeting in Mexico City in March the International Lead-Zinc Study Group announced that lead supplies were to be reduced to a level 2 per cent below estimated 1961 consumption. No action was taken on zinc. By the middle of October, however, when the Group met again in Geneva, the prices of both metals had fallen further. The Study Group still expects new supplies and consumption of zinc to be in approximate balance next year.

Keenly competitive conditions in the aluminium industry are being reflected in profit margins. In the United States production of primary metal in the first ten months of this year was slightly lower than during the corresponding period of 1960. British sales of finished and semi-finished products are expected to be slightly down on last year's record total. It is noteworthy that marginal suppliers of primary metal have virtually disappeared from the British market. A feature of the year has been the increasing participation of the major North American producers in new projects throughout the globe. As a particularly striking example of their determination to obtain secure footholds in developing markets may be mentioned the aluminium complex being set up in Australia by a company formed by Alcoa in association with three Commonwealth companies. News of this project came little more than six months after the announcement that Kaiser Aluminium was to be associated with Consolidated Zinc in the development of an integrated aluminium industry in Australia and New Zealand.

Nickel can look back upon another year of progress and consolidation, highlighted by the start of production at the Thompson mine smelter in Manitoba. This centre is second in size only to the company's operations in the Sudbury district and will add more than 37,500 s. tons of nickel per year to the company's production.

Despite the vigorous efforts of the ubiquitous Japanese to develop new sources of ore supplies, it cannot be said that the high level of world steel production has been paralleled by any marked improvement in the markets for the steel industry metals as a whole. Great Lake shipments of iron ore were some millions of tons lower this season, due to the recession in American steel production. Maganese and chrome are still suffering from depressed markets and over-production.

The triumphs of Russia and American in space exploration have given a further stimulus to the development of the newer metals. Beryllium continues to occupy much of the limelight, but much technological effort is still needed before its immense potential can be fully realised. Among other metals likely to play a key part in space exploration may be mentioned titanium, caesium, tungsten, tantalum, columbium, molybdenum and rhenium.

In all five continents, and on both sides of the Iron and Bamboo curtains, the search for minerals and the development of new mines has continued apace. Particularly noteworthy has been the extent to which German and Japanese capital and know-how are being associated with mining and exploration throughout the world, but technicians from Russia and Eastern Europe are also becoming increasingly prominent. It has yet to be seen whether the establishment of the new Department of Technical Co-operation will assist in putting British mining know-how on a more effective footing in areas of the world which are attractive to British risk capital, thereby paving the way for bigger exports of mining machinery and equipment.

THE FUTURE OF IRON-MAKING IN THE BLAST FURNACE

ON Wednesday and Thursday, November 29 and 30, the autumn general meeting of the Iron & Steel Institute was held in London. The technical sessions included a symposium on "The Future of Iron-making in the Blast Furnace". These technical sessions were devoted to four subjects, namely injection processes, hot blast stoves, burden preparation, and furnace engineering. The sessions were decidedly international in character with papers from France, Belgium and the United States as well as from the United Kingdom.

The session on injection processes comprised seven papers, which were introduced by Dr. A. H. Leckie of the Iron & Steel Board who acted as rapporteur for the session. They covered a wide range—from entirely theoretical on the one hand to completely practical on the other. The theoretical papers—by J. M. Ridgion of B.I.S.R.A. and J. Taylor and H. B. Bell of Royal Technical College, Glasgow—laid out principles for the calculation of the effect of injection upon furnace operation. Two further papers, by R. V. Trense and D. Rosborough of Esso Research and N. B. Melcher, W. N. Mahan and P. L. Woolf of the U.S. Bureau of Mines, dealt with both the theoretical and the practical aspects of the problem. The latter paper detailed the experimental work on injection carried out at the Bureau's small (4 ft. hearth dia.) experimental furance at Bruceton (U.S.). This work has covered a wide field and included the injection of natural gas, oil and anthracite into the furnace. The results of one recent series of trials show what major changes in furnace operation may take place in the future, since the injection of 5 cwts./ton of oil together with blast oxygenation (at the rate of about 4,000 c.f. added O_2/ton) reduced the furnace coke rate to around 6 cwts./ton.

The remaining three papers dealt exclusively with the practice of oil injection. These were by K. C. Sharp of Steel Co. of Wales, W. C. R. Penry and J. Catlow of Richard Thomas and Baldwins Ltd., Ebbw Vale, and P. Hazard of Acieries de Pompey, France. These papers all showed that oil injection, particularly when accompanied by increased blast temperature, gave substantial coke savings and an increased pig iron output.

Lively Discussion

The discussion which followed the rapporteur's introduction was extremely lively. Details of further injection practices were given—notably of oil injection at Bilston and at the Bessemer furnaces of Dorman Long; oil and natural gas injection at Le Boucau (France) and coal injection at Buffalo (U.S.). These last results, presented by Dr. R. Dietz of the National Steel Corporation (U.S.), were received with special interest as they were the first official figures of coal injection practice. Up to 30 per cent of the coke had been replaced by coal, which was pneumatically conveyed to, and injected at, the tuyeres, but a 15 per cent replacement was the normal level. At low replacement levels 1 lb. of coke could be replaced by 1 lb. of coal but at higher levels of coal injection the replacement ratio was not so favourable. It had been indicated earlier in the discussion that the N.C.B. were co-operating with the Stanton Ironworks to carry out coal injection trials at Stanton early in the New Year. It was mentioned that R.T.B. at Ebbw Vale had experimented with the injection of coal-oil slurries, and also flue dust-oil slurries.

From the papers and the discussion it was very clear that coke's long reign as the one and only fuel for blast furnaces was over. Earlier conferences—notably the one organised by the American Institute of Mining and Metallurgical Engineers at Philadephia in the spring—had shown that natural gas could replace part of the coke, reducing the overall coke rate to less than 10 cwts. in favourable cases. Now is was very clear that oil injection had established itself in a number of countries, notably the U.K. This meant that, at the present time, some 20 per cent of the coke could be replaced by oil in those furnaces where injection was practised and that, if oxygen enrichment of the blast were also carried out, the coke requirement of the furnace could be almost halved. It was clear, however, that the coal interests had reacted strongly to this challenge and were actively engaged in developing means of injecting coal—either on its own or as a coal-oil slurry—into the blast furnace with the hot blast. The advantage of this is that the relatively cheap, abundant non-coking coal could be used rather than the more expensive coking coal.

The Second and Third Sessions

The second session dealt with the theory and practice of hot blast stove operation. This followed naturally on the injection sessions since the maximum benefits could be obtained from injection practices if the highest possible blast temperature were attained. Six papers were presented dealing with the design and operation of stoves, the theoretical treatment of heat transfer in stoves and new blowing and heating systems for the blast furnace. The papers were introduced jointly by Mr. S. H. Brooks of the Appleby-Frodingham Steel Co. acting as rapporteur for the session, and a vigorous discussion followed. It was clear that the advantages of higher blast temperatures were such that operators were demanding blast temperatures of up to 1,100 deg. C. Whilst it is possible to design stoves which will meet this requirement, more fundamental information is necessary before the optimum design and operation can be arrived at.

The third session dealt with burden preparation. Six papers were discussed dealing with the effect of burden preparation on furnace operation in four different countries, the U.K., the U.S., France and Belgium. Mr. Hunter of the Workington Iron & Steel Company acted as rapporteur of this session, introducing the papers.

The papers by T. P. Hodson and G. R. Spring of Stanton Ironworks, W. E. Osgerby of Millom Hematite Co. and J. Boland of S. A. Cockerill-Ougree (Belgium) all showed the very marked improvements in furnace operation caused by improved burden preparation. The results from Stanton and Ougree were very similar; in both cases a mixed burden was used (rich and lean ores), coke rates were reduced from more than 19 cwts./ton to just over 14 cwts./ton with in-

creases in production of over 50 per cent. The results from Millom also highlighted the excellent furnace operation which could be obtained when a furnace was entirely burdened with self-fluxing sinter. Here, making hematite iron, the coke rate had been reduced to under 12 cwts./ton for 13 consecutive weeks.

A paper by N. D. Macdonald dealt with the effect of sinter quality on blast furnace operation at the Appleby-Frodingham Ironworks. It was shown that the removal of the minus $\frac{3}{8}$ in. sinter immediately before charging to the furnace allowed the furnace productivity to be increased by some 30 per cent or more.

The paper by J. E. Astier, J. Michard and P. Dencoisne discussed recent Continental experience using 100 per cent self-fluxing sinter made from Lorraine ores. It is clear that considerable decreases in coke rate and increases in production can be obtained by this means, and changes from the 1959 French operation of 20 cwts./ton coke rate and 12,500,000 tons pig output to 17 cwts./ton coke rate and 20,000,000 tons output in 1965 are envisaged. This will call for a very substantial increase in sinter plant capacity, i.e. from the present 3,300,000 tons to an estimated 26,000,000 tons in 1965. This is coupled with developments in the benefication of Lorraine ores by means of which the blast furnace slag volume could eventually be reduced from 24 cwts./ton to 16 cwts./ton.

The paper which provoked the greatest interest in this session was that by T. F. Old of the Armco Steel Corporation, U.S., entitled "Blast Furnace Operation using Iron Ore Pellets". This paper clearly showed the remarkable blast furnace performances which could be obtained when a burden entirely consisting of pelletized concentrates was charged to the furnace. In June 1960 a furnace with a hearth diameter of 28 ft. produced an average of 2,940 net tons/day—at a coke rate of 1,300 lbs./N.T., the blowing rate being of the order of 130,000 c.f.m. This represents a doubled output compared with 1954 practice. Later, at a rather lower output rate, the coke rate dropped to 1,180 lbs./N.T. With these figures in mind, coupled with the known fact that other American operators have had similar results with pellet operation, the very rapid growth in pellet production is not surprising. From a trickle in 1956 deliveries reached 13,000,000 tons in 1960; and looking into the future the combined production capacities in the United States and Canada predicted for 1964 and 1968 are 29,000,000 and 56,000,000 respectively.

In the discussion which followed these papers a number of facets of the problem of burden preparation were considered. The importance of good physical quality in pellets was stressed. The possibility of making self-fluxing pellets and so reducing the coke rate whilst maintaining production was raised, whilst an alternative proposal—to use say 70 per cent pellets with 30 per cent super-fluxed sinter—was also mentioned. The best pellet size was queried and it was stated that $\frac{11}{32}$ in. pellets were now used at Armco.

It was pointed out that, whilst the screening of sinter before the blast furnace could materially increase production, it also markedly increased the circulating load on the sinter plant and hence reduced sinter plant productivity. It was felt that more thought should be given to improving sinter plant performance to increase sinter strength and so minimise the quantity of fines reaching the furnace.

The final session dealt with Furnace Engineering—at which three papers were presented dealing with "Developments in iron-making and furnace design at Appleby-Frodingham from an engineering aspect", "Blast furnace engineering development" and "Blast furnace refractories". In these papers and the discussion which followed the engineering problems posed by such developments as increased furnace productivity, increased hot blast temperature, fuel injection, etc. were discussed.

Mining News from Brazil

BRAZIL'S first industrial plant producing metallic zinc is scheduled to start operating at Itaguai, in the State of Rio, towards the end of 1961, with an initial output of 7,200 tons of ingots. The domestic demand for zinc is now 35,000 tons yearly. Companhia Mercantil e Industrial, owners of the factory, will process calamine from the rich deposits of Vazante, in Minas Gerais, with reserves of over 6,000,000 tons of high grade ore.

*

Five concessions have been granted to exploit calamine deposits at Vazante and three to work others at Januaria, but technical difficulties, now overcome by Inga's method, have hitherto prevented industrial exploitation (see *The Mining Journal*, November 2, 1956 and May 20, 1960).

*

Armour Research Foundation is assisting Cia. Beneficiammento de Minerio Itabira, a subsidiary of Cia. Vale do Rio Doce, to process itabirite, raising the average Fe content from 42 to 60 per cent for exportation.

*

The Japanese Mission to Brazil has signed a contract to import 5,000,000 tons of Brazilian iron ore annually during 10 to 15 years. Vale do Rio Doce aims to raise its export target from 5 to 20,000,000 tons in the near future. A Roumanian Trade Mission has agreed to import up to 300,000 tons annually during three years at U.S.$11.25 per ton.

*

An important deposit of turmaline has been discovered in pegmatites at Serra da Cacunda, Municipality of Governador Valladares, Minas Gerais. There are three other registered turmaline mines, one each in Minas Gerais, Ceara and Sao Paulo.

*

The first regular steamship line over the Paraquay and Parana Rivers between Corumba, in Mato Grosso and Buenos Aires, was inaugurated in November by *S.S. Urucum I*, towing six lighters, loaded with manganese and iron. The vessel, 195 feet in length, of 3,600 h.p., drawing 3.10 feet, is the first of a fleet purchased by Sociedade Brasileira de Mineraçco to guarantee regular shipments from the Urucum mines to U.S. Steel Corporation.

*

ALCAN has increased its share in the capital of Aluminio de Minas Gerais and Aluminio do Brasil by U.S.$9,800,000. Brazilian production of aluminium reached 18,700 tons in 1960 for an apparent consumption of 33,713 tons.

*

The Companhia Siderúrgica da Amazônia (SIDERAMA) has been formed in Manaus, Amazonas, to build a steel mill with an annual production capacity of 100,000 tons of steel. The West German firm Krupp is reported to have already undertaken to supply and install the necessary equipment for the mill, against payment in iron ore from the large, high-grade reserves owned by the Brazilian company along the Jatapú river.

Admiral Lúcio Meira took office as the new president of the Companhia Siderúrgica Nacional on November 21. At the ceremony, he stated that the steel producing capacity of the Volta Redonda plant would soon be raised to 1,400,000 tons and later, with the construction of a third furnace, to 2,500,000 tons a year.

THE FUTURE OF IRON-MAKING IN THE BLAST FURNACE

ON Wednesday and Thursday, November 29 and 30, the autumn general meeting of the Iron & Steel Institute was held in London. The technical sessions included a symposium on "The Future of Iron-making in the Blast Furnace". These technical sessions were devoted to four subjects, namely injection processes, hot blast stoves, burden preparation, and furnace engineering. The sessions were decidedly international in character with papers from France, Belgium and the United States as well as from the United Kingdom.

The session on injection processes comprised seven papers, which were introduced by Dr. A. H. Leckie of the Iron & Steel Board who acted as rapporteur for the session. They covered a wide range—from entirely theoretical on the one hand to completely practical on the other. The theoretical papers—by J. M. Ridgion of B.I.S.R.A. and J. Taylor and H. B. Bell of Royal Technical College, Glasgow—laid out principles for the calculation of the effect of injection upon furnace operation. Two further papers, by R. V. Trense and D. Rosborough of Esso Research and N. B. Melcher, W. N. Mahan and P. L. Woolf of the U.S. Bureau of Mines, dealt with both the theoretical and the practical aspects of the problem. The latter paper detailed the experimental work on injection carried out at the Bureau's small (4 ft. hearth dia.) experimental furance at Bruceton (U.S.). This work has covered a wide field and included the injection of natural gas, oil and anthracite into the furnace. The results of one recent series of trials show what major changes in furnace operation may take place in the future, since the injection of 5 cwts./ton of oil together with blast oxygenation (at the rate of about 4,000 c.f. added O_2/ton) reduced the furnace coke rate to around 6 cwts./ton.

The remaining three papers dealt exclusively with the practice of oil injection. These were by K. C. Sharp of Steel Co. of Wales, W. C. R. Penry and J. Catlow of Richard Thomas and Baldwins Ltd., Ebbw Vale, and P. Hazard of Acieries de Pompey, France. These papers all showed that oil injection, particularly when accompanied by increased blast temperature, gave substantial coke savings and an increased pig iron output.

Lively Discussion

The discussion which followed the rapporteur's introduction was extremely lively. Details of further injection practices were given—notably of oil injection at Bilston and at the Bessemer furnaces of Dorman Long; oil and natural gas injection at Le Boucau (France) and coal injection at Buffalo (U.S.). These last results, presented by Dr. R. Dietz of the National Steel Corporation (U.S.), were received with special interest as they were the first official figures of coal injection practice. Up to 30 per cent of the coke had been replaced by coal, which was pneumatically conveyed to, and injected at, the tuyeres, but a 15 per cent replacement was the normal level. At low replacement levels 1 lb. of coke could be replaced by 1 lb. of coal but at higher levels of coal injection the replacement ratio was not so favourable. It had been indicated earlier in the discussion that the N.C.B. were co-operating with the Stanton Ironworks to carry out coal injection trials at Stanton early in the New Year. It was mentioned that R.T.B. at Ebbw Vale had experimented with the injection of coal-oil slurries, and also flue dust-oil slurries.

From the papers and the discussion it was very clear that coke's long reign as the one and only fuel for blast furnaces was over. Earlier conferences—notably the one organised by the American Institute of Mining and Metallurgical Engineers at Philadephia in the spring—had shown that natural gas could replace part of the coke, reducing the overall coke rate to less than 10 cwts. in favourable cases. Now is was very clear that oil injection had established itself in a number of countries, notably the U.K. This meant that, at the present time, some 20 per cent of the coke could be replaced by oil in those furnaces where injection was practised and that, if oxygen enrichment of the blast were also carried out, the coke requirement of the furnace could be almost halved. It was clear, however, that the coal interests had reacted strongly to this challenge and were actively engaged in developing means of injecting coal—either on its own or as a coal-oil slurry—into the blast furnace with the hot blast. The advantage of this is that the relatively cheap, abundant non-coking coal could be used rather than the more expensive coking coal.

The Second and Third Sessions

The second session dealt with the theory and practice of hot blast stove operation. This followed naturally on the injection sessions since the maximum benefits could be obtained from injection practices if the highest possible blast temperature were attained. Six papers were presented dealing with the design and operation of stoves, the theoretical treatment of heat transfer in stoves and new blowing and heating systems for the blast furnace. The papers were introduced jointly by Mr. S. H. Brooks of the Appleby-Frodingham Steel Co. acting as rapporteur for the session, and a vigorous discussion followed. It was clear that the advantages of higher blast temperatures were such that operators were demanding blast temperatures of up to 1,100 deg. C. Whilst it is possible to design stoves which will meet this requirement, more fundamental information is necessary before the optimum design and operation can be arrived at.

The third session dealt with burden preparation. Six papers were discussed dealing with the effect of burden preparation on furnace operation in four different countries, the U.K., the U.S., France and Belgium. Mr. Hunter of the Workington Iron & Steel Company acted as rapporteur of this session, introducing the papers.

The papers by T. P. Hodson and G. R. Spring of Stanton Ironworks, W. E. Osgerby of Millom Hematite Co. and J. Boland of S. A. Cockerill-Ougree (Belgium) all showed the very marked improvements in furnace operation caused by improved burden preparation. The results from Stanton and Ougree were very similar; in both cases a mixed burden was used (rich and lean ores), coke rates were reduced from more than 19 cwts./ton to just over 14 cwts./ton with in-

creases in production of over 50 per cent. The results from Millom also highlighted the excellent furnace operation which could be obtained when a furnace was entirely burdened with self-fluxing sinter. Here, making hematite iron, the coke rate had been reduced to under 12 cwts./ton for 13 consecutive weeks.

A paper by N. D. Macdonald dealt with the effect of sinter quality on blast furnace operation at the Appleby-Frodingham Ironworks. It was shown that the removal of the minus $\frac{3}{8}$ in. sinter immediately before charging to the furnace allowed the furnace productivity to be increased by some 30 per cent or more.

The paper by J. E. Astier, J. Michard and P. Dencoisne discussed recent Continental experience using 100 per cent self-fluxing sinter made from Lorraine ores. It is clear that considerable decreases in coke rate and increases in production can be obtained by this means, and changes from the 1959 French operation of 20 cwts./ton coke rate and 12,500,000 tons pig output to 17 cwts./ton coke rate and 20,000,000 tons output in 1965 are envisaged. This will call for a very substantial increase in sinter plant capacity, i.e. from the present 3,300,000 tons to an estimated 26,000,000 tons in 1965. This is coupled with developments in the benefication of Lorraine ores by means of which the blast furnace slag volume could eventually be reduced from 24 cwts./ton to 16 cwts./ton.

The paper which provoked the greatest interest in this session was that by T. F. Old of the Armco Steel Corporation, U.S., entitled "Blast Furnace Operation using Iron Ore Pellets". This paper clearly showed the remarkable blast furnace performances which could be obtained when a burden entirely consisting of pelletized concentrates was charged to the furnace. In June 1960 a furnace with a hearth diameter of 28 ft. produced an average of 2,940 net tons/day—at a coke rate of 1,300 lbs./N.T., the blowing rate being of the order of 130,000 c.f.m. This represents a doubled output compared with 1954 practice. Later, at a rather lower output rate, the coke rate dropped to 1,180 lbs./N.T. With these figures in mind, coupled with the known fact that other American operators have had similar results with pellet operation, the very rapid growth in pellet production is not surprising. From a trickle in 1956 deliveries reached 13,000,000 tons in 1960; and looking into the future the combined production capacities in the United States and Canada predicted for 1964 and 1968 are 29,000,000 and 56,000,000 respectively.

In the discussion which followed these papers a number of facets of the problem of burden preparation were considered. The importance of good physical quality in pellets was stressed. The possibility of making self-fluxing pellets and so reducing the coke rate whilst maintaining production was raised, whilst an alternative proposal—to use say 70 per cent pellets with 30 per cent super-fluxed sinter—was also mentioned. The best pellet size was queried and it was stated that $\frac{11}{32}$ in. pellets were now used at Armco.

It was pointed out that, whilst the screening of sinter before the blast furnace could materially increase production, it also markedly increased the circulating load on the sinter plant and hence reduced sinter plant productivity. It was felt that more thought should be given to improving sinter plant performance to increase sinter strength and so minimise the quantity of fines reaching the furnace.

The final session dealt with Furnace Engineering—at which three papers were presented dealing with "Developments in iron-making and furnace design at Appleby-Frodingham from an engineering aspect", "Blast furnace engineering development" and "Blast furnace refractories". In these papers and the discussion which followed the engineering problems posed by such developments as increased furnace productivity, increased hot blast temperature, fuel injection, etc. were discussed.

Mining News from Brazil

BRAZIL'S first industrial plant producing metallic zinc is scheduled to start operating at Itaguai, in the State of Rio, towards the end of 1961, with an initial output of 7,200 tons of ingots. The domestic demand for zinc is now 35,000 tons yearly. Companhia Mercantil e Industrial, owners of the factory, will process calamine from the rich deposits of Vazante, in Minas Gerais, with reserves of over 6,000,000 tons of high grade ore.

*

Five concessions have been granted to exploit calamine deposits at Vazante and three to work others at Januaria, but technical difficulties, now overcome by Inga's method, have hitherto prevented industrial exploitation (see *The Mining Journal*, November 2, 1956 and May 20, 1960).

*

Armour Research Foundation is assisting Cia. Beneficiammento de Minerio Itabira, a subsidiary of Cia. Vale do Rio Doce, to process itabirite, raising the average Fe content from 42 to 60 per cent for exportation.

*

The Japanese Mission to Brazil has signed a contract to import 5,000,000 tons of Brazilian iron ore annually during 10 to 15 years. Vale do Rio Doce aims to raise its export target from 5 to 20,000,000 tons in the near future. A Roumanian Trade Mission has agreed to import up to 300,000 tons annually during three years at U.S.$11.25 per ton.

*

An important deposit of turmaline has been discovered in pegmatites at Serra da Cacunda, Municipality of Governador Valladares, Minas Gerais. There are three other registered turmaline mines, one each in Minas Gerais, Ceara and Sao Paulo.

*

The first regular steamship line over the Paraquay and Parana Rivers between Corumba, in Mato Grosso and Buenos Aires, was inaugurated in November by *S.S. Urucum I*, towing six lighters, loaded with manganese and iron. The vessel, 195 feet in length, of 3,600 h.p., drawing 3.10 feet, is the first of a fleet purchased by Sociedade Brasileira de Mineraçco to guarantee regular shipments from the Urucum mines to U.S. Steel Corporation.

*

ALCAN has increased its share in the capital of Aluminio de Minas Gerais and Aluminio do Brasil by U.S.$9,800,000. Brazilian production of aluminium reached 18,700 tons in 1960 for an apparent consumption of 33,713 tons.

*

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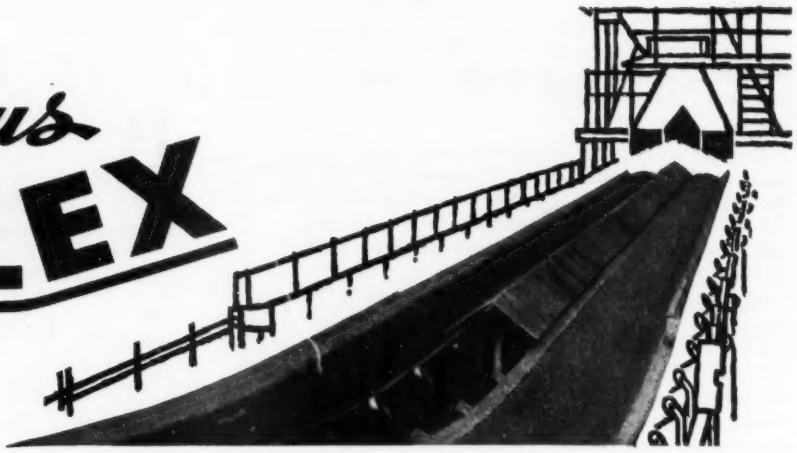

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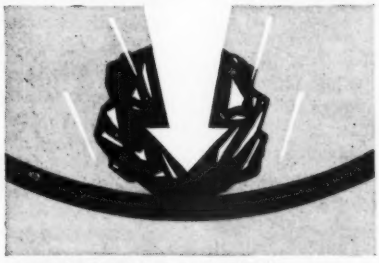

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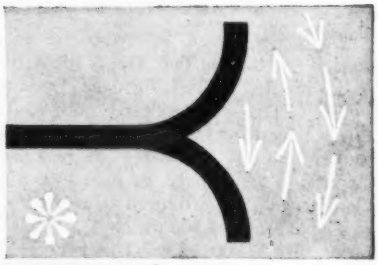

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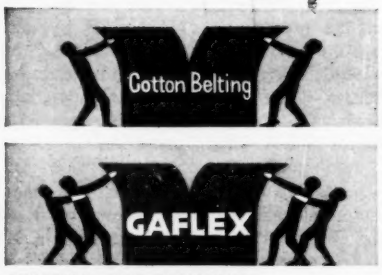

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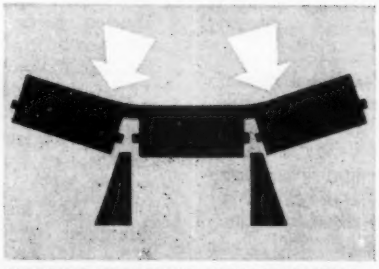

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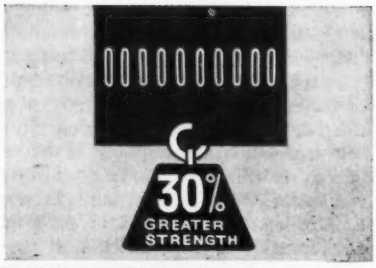

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Opencast Rockbreaking in the U.S.

ALTHOUGH jet piercing has long been established as the most efficient blasting method in the open pit taconite mining operations of the Erie Mining Co. in America's Mesabi Range, there has been continuous testing of other types of drills since 1948. This was reported by F. D. Bickel in *Mining Congress Journal*, Vol. 47, No. II, who described the Erie pit holes as averaging 9 in. dia., this requiring a relatively large drilling pattern. Deck loading of the charge is impracticable, and the blast hole must be entirely filled with explosives.

Problem of Breakage

The problem is therefore to produce an acceptable breakage in widely spaced, large diameter holes, loaded heavily with the most suitable blasting agent. In this method, as practiced at Erie, the column is loaded close to the surface and the best possible short delay blasting pattern established. This build-up charging (to within 4 ft., 5 ft. or 6 ft. of surface depending on conditions) is necessary to reduce the upper fragmentation to manageable size. Loading ratios range from 1.4 lb. per cu. yd. to over 2.0 lb. per cu. yd.

The fact that where necessary a drilled hole may be enlarged at the bottom is another advantage of drilling by jet piercing. The operation is performed by making a second or third pass at any desired rate. The chamber thus enlarged permits heavier bottom loading in hard ground.

A jet piercing rig produces a very rough or corrugated hole due to the unequal rates of spalling in passing through the various layers in the taconite. Although dimensions average about 9 in., the minimum is 6½ in. and the maximum 18 in.

Other experiments have been completed on the short interval delay period between holes and between rows. The standard pattern of 20 ft. burden by 22 ft. spacings for hard blasting materials and 20 ft. by 24 ft. has been established for a long time. Some months ago drill hole patterns were increased to 21 ft. by 26 ft. The results were apparently satisfactory. The nominal blast is four rows (or 80 ft.) wide, with possible temporary variations.

The original delay and Primacord combination was with 17 millisecond connectors between the 45 deg. echelon cords. It was observed that backbreak was excessive with a minimum of forward movement of the blast. Longer delays were provided by introducing the millisecond connectors into the echelons. Performance was immediately improved. It was found, however, that this system was laborious to connect up, whilst at the same time the potential number of misfires was increased.

It is important to realize that in these altered systems, the pattern of holes is not changed, but only the blasting sequence, with cut into the face carried during blasting at about 20 deg. rather than 45 deg.

Angle Drilling

In the same journal B. J. Kochanowsky showed that angle drill is a new and a better blasting method than others now used in the industry. It can be said, according to the author, that this can be described as a new method because nowadays practically only vertical or horizontal holes or a combination of both are in use in U.S. domestic mining.

It is known that much less explosive per unit of volume is needed to break a boulder than to blast rock from a bench. Also, the nearer the explosive is moved along the borehole to the toe of the bench, more pounds of explosive are required to blast a ton of rock. Excepting for slight amounts, the amount of explosive charge is inversely proportional to the number of free faces. It is known that the law governing the rock failure in small and large scale blasts may differ. It is also known that it is difficult to simulate in the laboratory, the natural conditions in the quarry or stripping operations. However, on large scale blasts, it is difficult to keep the factors affecting blasting results under strict control.

Less drill footage is required for angle holes than for vertical boreholes. Each foot of hole above the quarry level breaks equal quantity of rock assuming the burden in both cases is the same. However, greater spacing and less subdrilling can be used with an angle hole. Therefore, larger rock volume can be blasted per foot of borehole using inclined drilling.

The blast tests in Plexiglass demonstrated that much larger throw distance can be obtained with an inclined borehole. The throw distance obtained in a 1.5 in. bench with 0.47 in. burden was 11 to 12 ft. for vertical and 33 to 35 ft. for 45 deg. inclined boreholes. In 0.63 in. burden the throw distance obtained with a vertical hole was none, with a 45 deg. inclined hole it was seven ft. These results are of importance for casting rock with explosive in stripping operations or in road construction.

In a basalt quarry of the Rock Hill plant belonging to the General Crushed Stone Co., 20 deg. from vertical inclined borehole drilling has been gradually introduced in a 40-ft. bench since January 1959. Taking the total explosive consumption and tonnage produced, from year to year, the powder factor has been improved from 2.97 tons per lb. explosive in 1958 to 3.66 tons per lb. in 1960. In the same time the percentage of ammonium nitrate used increased from 30.1 to 39.5 per cent. The product from burden times spacing has been increased from 18 x 18 = 324 sq ft. to 18 x 20 = 360 sq. ft. Therefore, the drilling cost has been reduced $0.99 per ton. The blast effect of the last four blasts was such that it is planned to use 19 ft. burden and 21 ft. spacing in the future. Thus, further saving in cost for explosive and drilling are expected.

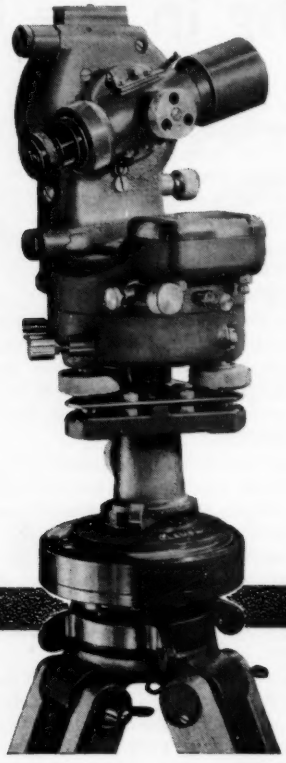
This quarry has a second bench 180 ft. high. It was abandoned years ago because of toe problems and now angle drilling is being adopted on this high bench.

Benefits of Inclined Drilling

Benefits enjoyed from the use of inclined drilling:

Safer operation for men, shovels; higher benches may be blasted and number of haulage levels reduced; toe and back breakage can be eliminated; better fragmentation will occur because of better utilization energy and reduced rock resistance against blasting at the bottom of the bench, because of the reduced rock volume around the stemmed part of the borehole at the top of the bench, where there are usually large boulders; cheaper blasting operations will be obtained, because less footage on drill and/or less explosive per ton rock are required. Smaller borehole diam. can be used. Because a length of borehole used for stemming and for subdrilling is a constant for a given burden, and the inclined hole is longer than a vertical one in a given bench height, more explosive can be loaded in an inclined borehole. Thus, a higher utilization of borehole is possible; the damage to coal by blasting the waste rock in coal stripping operations will be much smaller or even altogether absent. The throw distance will be greater; in the same bench height, the angle hole is longer. Therefore, larger tonnage can be blasted per foot of bench face length with the same burden.

Watts Mining Transit



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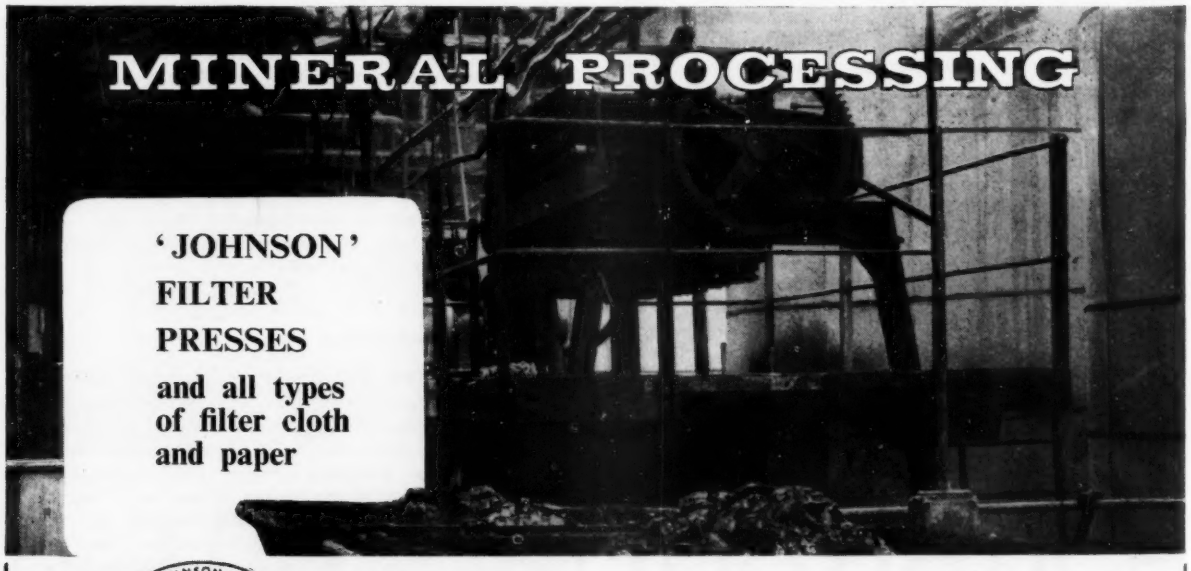

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BERYLLIUM IN PERSPECTIVE

BERYLLIUM presents a confused picture at the present time. In an attempt to assess the position and outlook of this much talked about metal, the authors of an E. and M.J.* survey, Al Knoerr and Mike Eigo, questioned a number of well-informed people in industry and in the U.S. government, whose conclusions are summarized as follows:

1. There is no beryllium boom, nor is a boom in sight. An "exploding" need for beryllium would be signalled in two ways: A. If military, nuclear and spacecraft requirements dictate a surging demand for beryllium, those agencies in Washington responsible for the acquisition of critical raw materials will clearly indicate the need by establishing large-scale stockpile purchases and exploration incentives, as they have done for uranium and other critical minerals. Today beryllium mineral stockpiles are adequate for current and future needs. Present sources of supply are comfortable. B. A boom for beryllium would show up in greatly stimulated ore markets and higher prices for beryllium minerals. Neither of these indications have materialized, nor are they likely to do so during the next few years.

2. Beryllium mining and production is not for the amateur. Unless a company is well-heeled financially (to the tune of millions of dollars) and technically competent to find the ore, develop economic but costly extraction processes, and sell the product through expensive market research programmes, entrance into the beryllium field will be unsound. A thoroughly integrated mine-to-market organization, either by individual companies, or an alliance of companies, is essential to successful participation in the beryllium industry.

A Bright Future

3. Beryllium has a good future. Total sales of beryllium oxide and metal products of the two major U.S. producers, Brush Beryllium and Beryllium Corp., have increased from $39,300,000 in 1959 to $53,000,000 in 1960. The total for the first half of 1961 was $28,200,000. Existing new technical and economic developments, many of them currently under way, will contribute to the substantial growth of the beryllium market. Beryllium's unique properties ensure expanding use in aircraft, spacecraft, nuclear equipment, and possibly in high energy fuels. (These prospects are discussed in some detail in the E. and M.J. Survey.) Obstacles to the development of beryllium markets are being erased. Raw material sources in the U.S. and elsewhere are now adequate to fulfil foreseeable needs. New techniques in mineral processing have been developed to extract beryllium from the large Topaz-Spors Mountain area in Utah, and from Nevada deposits, as well as from pegmatites. Several major companies with large financial resources are quietly entering the exploration and metallurgical field. When the markets materialize, they will be ready. Research to develop a truly ductile beryllium has made great progress during the past year. Coupled with lightness of the metal, this quality, when perfected, could stimulate tremendous markets.

4. As an indication of the miner's stake in beryllium, Knoerr and Eigo estimate that the value of beryllium minerals is approximately 10 per cent of the sales value of the metal and oxide combined. In the U.S. there is thus about a $4,000,000-$6,000,000 annual market for the mineral and ores. This compares with an annual domestic market of $300,000,000 for uranium ores and concentrates.

Ore Resources

A year ago both the U.S. metal refiners, Brush and Berylco, were dependent upon foreign ores for the bulk of their production. Since that time, the disseminated ores of the Topaz-Spors Mountain area have been discovered, tested and successfully processed. Beryllium Resources has developed its Van Dornick flotation process for the disseminated Topaz-Spors ores, while United Technical Industries announced that its chemical process plant at Delta—operating on the same ores—was producing commercial BeO. The BRI process produces a concentrate which is used by Brush at Elmore, Ohio, to make BeO and, subsequently, metal.

Today, Brush has a 29.5 per cent interest in Beryllium Resources' Utah holdings and output, while Berylco has signed a "joint venture" with UTI. Both refiners have produced metal from the feed material supplied from Utah and both BRI and UTI are building or are already operating feed material facilities.

The ore supply situation appears to be rather difficult to assess. Reliable reserve figures are not available for the Topaz Mountain district, but statements by officials of several of the prominent companies active in the area place the total reserves at over 3,000,000 tons averaging nearly 1 per cent BeO.

The presidents of both UTI and BRI have indicated that the Topaz-Spors Mountain deposits make the U.S. totally self-sufficient in beryllium refinery feed materials. Yet the president of Standard Beryllium, which operates the Boa Vista and other deposits in Brazil, states that he is doubling capacity on the strength of statements by beryl consumers that they will require all his production for the foreseeable future.

Domestic and Imported Ores

In March, 1961, the president of Berylco told his stockholders that he would not deny the existence of a valid argument in favour of establishing domestic ore sources "to dispel the philosophy of scarceness", but he continued as follows: "It would be a departure from this principle to indict the existing beryl import structure on grounds of insufficient abundance and remoteness, when its performance in recent years has demonstrated its ability to supply the expanding needs of the primary producers while maintaining stability of prices".

It might be added that imported ore suffers only one disadvantage against domestic—that of availability in case of political interruption of the normal channels of supply.

World production of beryl in 1960 was estimated to have reached the new record total of 11,000 s.tons of which Brazil accounted for 3,849 tons and sources in Africa for 4,548 tons. Mozambique was the second largest producer with 1,650 tons. U.S. beryl consumption amounted to 9,692 tons.

Current prices of beryllium metal in the U.S. are of the

**Published in the September, 1961, issue of "Engineering and Mining Journal", brings up to date a report on beryllium published in the September, 1960, issue of the same journal*

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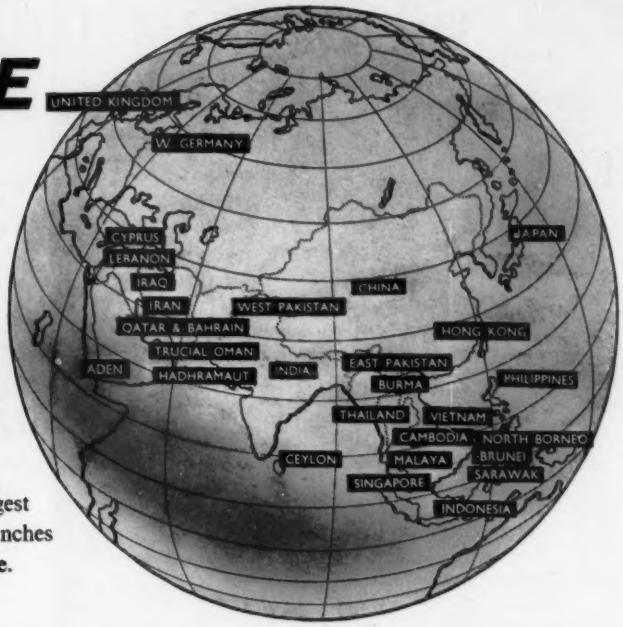

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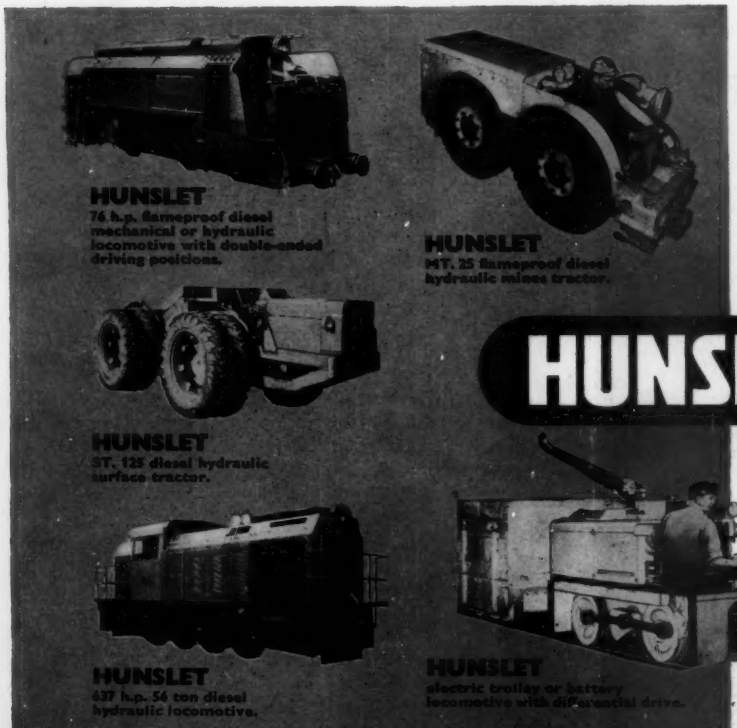
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H94

order of $50-$60 per lb. It has been estimated that process improvements currently pending, together with increased usage, could result in substantial savings in the immediate future. Even larger reductions are in the offing if greater usage is realized.

Properties and Uses of Beryllium

Beryllium, one of the new metals that have emerged as the demands of modern technology exceeded the performance limits of existing materials, is the subject of an illustrated brochure issued by Consolidated Beryllium Ltd., 6 St. James's Square, London, S.W.1. Consolidated Beryllium was formed in 1959 by the Consolidated Zinc Corporation Ltd. in partnership with the Beryllium Corporation of Reading, Pennsylvania, and is under the management of Imperial Smelting Corporation

BERYLLIUM came into prominence because of its unique role in the development of nuclear energy, and now it is becoming established as an engineering material, both in alloy form and in its elemental state. It is commercially available as rod, tube, strip, sheet and foil and, in America, large beryllium forgings of about 1 ton weight have been successfully produced. Already, it has many industrial applications, although the nuclear energy industry has been by far the largest consumer. There are indications, however, states the brochure, that in the U.S. nuclear requirements will soon be equalled or even exceeded by the demands of the aero-space industries.

Consolidated Beryllium Ltd. are the pioneers of beryllium metal production in the United Kingdom, operating metal reduction and beryllium-copper master alloy plants at Avonmouth, and a beryllium oxide preparation and ceramic ware factory at Milford Haven.

Beryllium, in Group II of the Periodic Table, has an atomic number of 4 and an atomic weight of 9.02. It crystallizes in the close-packed hexagonal system, is steel grey in colour and is one of the lightest of all metals with a density of 0.066 lb./in.^{3} (1.85 g./cm.^{3}). Its melting point (1,283 deg. C.) is one of the highest of the light metals; its modulus of elasticity is approximately 30 per cent higher than that of steel, and the electrical and thermal conductivity of beryllium are about 40 per cent of those of copper.

Beryllium, like aluminium, is protected by a thin oxide film which confers a good resistance to atmospheric corrosion. Tests indicate no severe corrosion in air when exposed for 200 hours at temperatures up to 400 deg. C. Chemically, beryllium is similar to aluminium.

Beryllium is non-magnetic, its reflectivity to white light is 55 per cent; and the velocity of sound in beryllium (41,300 ft./sec.) is exceptionally high.

The physical and mechanical properties of the metal are summarized in the brochure.

Attractions to the Nuclear Engineer

Beryllium is attractive to the nuclear engineer because of its very low thermal neutron absorption cross-section (0.01 barns) combined with a fairly high melting point and light weight. It is used in nuclear reactors as a moderator or reflector and it will probably be used as a canning material for the uranium oxide fuel in advanced gas-cooled reactors. Other uses include tubes for neutron sources and X-ray windows.

The most notable properties of beryllium which are of interest to the designer of advanced aircraft structures are listed as follows:—

High strength-to-weight ratio which is maintained to high temperatures—exceeds all known structural materials;
High modulus of elasticity at temperatures up to 600 deg. C.—1½ times that of steel and 2½ times that of titanium alloys;
High specific heat—higher than most other metals;
High thermal diffusivity, approaching that of aluminium;
High melting point;
Low coefficient of expansion—similar to steel.

As an example of its potential structural advantages, a hypothetical design study for a mach 0.85 transport aircraft of 35,000 lb. payload and 2,000 mile range, showed that a reduction in structure weight of 50 per cent is achieved by using beryllium in place of aluminium. On this basis, the extended range or greater payload permitted by using beryllium is a valuable reward.

Due to the favourable thermal properties it can be shown that for a given heat input, the thermal stress developed in a beryllium structure is about half of that in a titanium structure and about a quarter of that in a steel structure.

At present, the major deterrent to the widespread use of beryllium as a structural material in aircraft is its low triaxial ductility. Fortunately, progress is being made towards a solution of the ductility problem, and the forms of beryllium available today have better mechanical properties than those available a few years ago.

Uses of Beryllium

Despite the present disadvantages of high cost and lack of ductility, compared with other light metals, it is probable that the favourable properties of beryllium can be utilized with advantage in certain specialized components. Some of the applications in existence or under consideration are summarized as follows:—

Hypersonic leading edges on aircraft wings; Fuselage plating inlet ducts; Control surfaces; Gas turbine engine parts; Aircraft disc brakes; Aircraft fasteners; High speed aircraft cameras; Aircraft instrument parts; High velocity test equipment; High frequency electronic parts; Rocket engine components.

The combination of high thermal conductivity, specific heat and latent heat of fusion has recently led to the choice of beryllium as a heat sink for capsules and other re-entry vehicles.

The high values of the specific moduli and strength/weight ratio suggest the use of beryllium for slender structures where the stiffness of existing materials is limiting, e.g. control fins of air-to-air and ground-to-air missiles and satellite structures. In these applications the benefits arising from weight saving are clearly very great indeed.

Beryllium is being used for certain components in advanced types of guidance systems, for example, gyroscopes and stable platforms. In this use the principal advantage of beryllium is its low density, but there are other equally desirable properties.

Because of its high stiffness the use of beryllium in place of other metals can increase the resonant frequency of a component; one result of this feature is the increased sensitivity obtainable in instruments that measure by an inertial mass—accelerometers, for example. The stiffness also minimizes errors due to mass shift under load. Currently, beryllium alloys with high precision elastic limit are being developed especially for gyroscope applications.

The non-magnetic nature of beryllium is an important property in many instrument parts.

Machinery and Equipment

Determining Rock Bolt Stress

A new device has been developed for the rapid and accurate determination of tension in rock bolts, described in *Northern Miner*, and known as the Horstman Photo Bolt Dynamometer, the new apparatus utilizes the photo-electric properties of a newly-developed plastic to provide a simple, inexpensive and rugged gauge which can be read by unskilled persons.

Developed and distributed by C-I-M Consultants Ltd., the new gauge is manufactured by Horstman Ltd., Bath, U.K.

The gauge consists of a hollow cylinder of a specially-impregnated nylon plastic between two plates, with a steel gauge washer below the bottom plate. All have a central hole through which the rock bolt passes. A rubber washer inside the plastic body centralizes the rock bolt and allows up to 5 deg. eccentricity. The unit is placed over the bolt between the end nut and bearing plate so that when the bolt is tightened the central block is compressed by the load in the bolt.

On one side of the body is fixed a plastic photo-elastic disc in contact with the block so that when it is in the reading position it is compressed by an amount equal to the compression produced in the block. This compression of the plastic disc produces a proportional number of lines or fringes which can be viewed readily by illuminating the disc. As the compression produced in the block is directly proportional to the load in the rock bolt, the number of lines or fringes in the disc is directly proportional to this load, which can then be estimated accurately in tons.

A cover is provided to protect the reading disc from blast, dust and water. The gauge has been designed to withstand rough conditions and all metallic parts are either of stainless steel or specially plated to prevent corrosion. Gauges have been prepared for a varity of conditions.

Several advantages are claimed for the new gauge. It overcomes the difficulties of accurately reading torque wrench loads caused by friction between the rock bolt and nut. It is compact, about 3¼ in. high, and 3½ in. by 2½ in. in section. The gauges are recoverable and can be used time and time again. The central hole is sufficiently large to permit using the gauge with rock bolts up to and including one inch in diameter.

In some applications, the gauges have been used between a timber cap and a post. By careful determination of stresses, some mines have been able to reduce the length, and consequently the cost, of their rock bolts. While practice may vary widely, it has been suggested that the gauge be used on every tenth bolt.

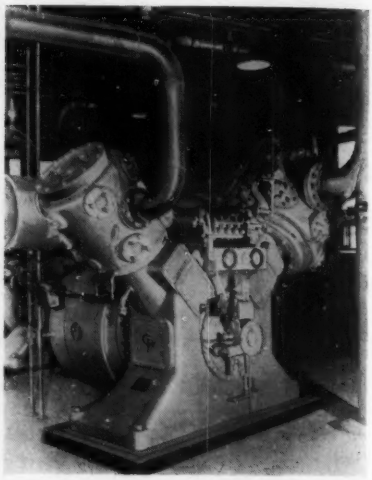
NEWS FROM HUNGARY

Dr. Gyula Bácskai, candidate of chemical sciences, the leader of the Corrosion Department of the Heavy Chemical Industries' Research Institute, Veszprém, Hungary, and fellow-workers, have evolved a new scientific method aimed at lessening the effects of corrosion caused by thermal waters. As is known, thermal waters—due partly to their fluid carbon dioxide content, and partly to their high salt content—are apt to cause a very fast corrosion in iron pipelines. In addition to corrosion, a heavy scale formation is observed in many cases. The usual protection against corrosion consists of tar or bituminous coatings. This, however, is unsuitable for the inside protection of pipes, on account of the temperature of the thermal waters.

The essence of the new invention lies in the circumstance that the thermal water, previous to entering the pipe conduits, is led through a container provided with a lumpy glass-like material. The water dissolves certain chemicals from this material which prevents the corrosion, and at the same time, strongly reduces the scale formation.

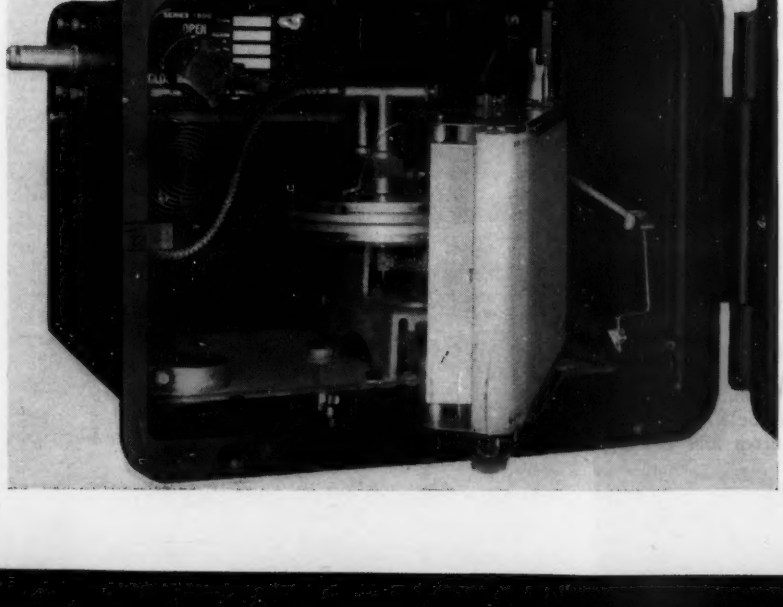
Workers at the Budapest Institute for Building Science and the Central Research Institute for Building Materials have elaborated a process for the manufacture of powdered coal-ash pellets.

The basic material of the pulverized coal-ash pellets consists of coal waste containing 10 per cent of inflammable material, 75 to 80 per cent of pulverized coal-ash and 10 per cent ductile material. The raw waste is dried, crushed to powder and subsequently well mixed with pulverized coal-ash and ductile material. The material then prepared after being wetted is fed into a plate-type granulator. In the granulator spherical pellets of 10 to 25 mm. dia. are formed. These are then burnt out in a shaft furnace at 900 to 1,000 deg C., during which the grains are transformed partly into a glasslike, and partly rock-like material. The finished pellets of pulverized coal-ash are taken off the furance at a temperature of about 200 deg. C., and the material is then ready for immediate use as concrete aggregate.



A new range of compact, heavy duty, water cooled, double acting, crosshead type, stationary air compressors, in which the cylinders are set 90 deg. apart, has been introduced by the Consolidated Pneumatic Tool Co., Ltd. The new range, know as the Y class, seen above, is available in seven sizes with outputs of from 372 to 1,615 c.f.m., at pressures of from 80-125 p.s.i., the horsepower range covered being from 75 to 300 b.h.p. Multistage units are available for pressures of up to 3,000 p.s.i. The compressor can be driven by a flange mounted motor, vee belt drive or by a direct coupled motor

The new Arkon high-range, differential pressure recorder with the chart unit partly swung clear to reveal the mechanism. The recorder can measure gas or air differential pressures up to 50 lbs. per sq. in. and can withstand static pressure up to 125 lbs. per sq. in. The two-way slack diaphragm movement and the two pressure inlets to it can be seen in the centre of the mechanism. Top left is the patented inlet valve control knob which brings the instrument into operation in one action and so dispenses with the conventional sequential opening of a three-cock inlet assembly. By Walker Crosweller & Co. Ltd. A useful application could be in mining



Minor or major-scale accidents have often resulted in mines when cables leading to drilling or loading machines became damaged by axes or picks or are run over by bogies. For this reason Akos Csabay, of Hungary have developed a rubber cable with a protective screening. In the event of damage to this cable (a prick or a cut), a device connected to it automatically disconnects the current, befor a permanent short-circuit can develop. For instance the screening effectively prevents the machine body from becoming live by getting into contact with one of the conductors. In such cases the safety device connected to the cables immediately switches off and prevents the current from reaching the machine as long as the body contact exists. Miners working with the machine are protected from any electric shock.

Insulated phase conductors are arranged in the cable within a conductor-rubber mixture. This is covered by an insulating layer followed by another conductor-rubber layer and, finally, covered by the outer jacket. Between the two conducting layers there is a d.c. voltage of 42 V. maximum and the protective relays are interconnected between these two. If the cable is damaged, the circuit is closed and the switch-off relay operates.

UNIT DUST COLLECTORS

Dallow Lambert Ltd. announce their new Uma Unimaster range of unit dust collectors which incorporate several outstanding advances in design for this type of equipment. The compact nature of the well-known Unimaster unit based on pad type filters is retained, and an entirely new design of one-piece filter pad assembly allows for easy removal for laundering or hygienic reasons. This new design also makes the replacement of filter elements a much cheaper matter. Greater spacing between filter pads allows for the handling of more difficult dusts. A new design of filter inserts in conjunction with a simplified shaker linkage and a new patent shaker bar result in greatly improved cleaning of the filter element. As compared with the original Unimaster, the horsepower of the electric shaker motor has been doubled. Additional improvements incorporated in the new range are as follows :—

(a) Improved fan performances.
(b) Re-designed dust seals to withstand greater pressure differentials.
(c) Greater rigidity of unit case and base.
(d) Easier manual release of filter pad seal frame.
(e) Extended range of filter fabrics, both natural and synthetic.

Continuous advances in the capacity of pneumatic conveying installations have led to a requirement for larger air venting filters and the Dallow Lambert Unimaster range has now been increased to include Units with 150 and 250 sq. ft. of filtration area, in addition to the 50 sq. ft. and 100 sq. ft. already being produced, to meet this demand. These models incorporate the same refinements in design as the Uma Unimaster unit dust collectors described.

Another complementary piece of electrical equipment now available from Dallow Lambert Ltd. is the patented Fulimatic control system for filter cleaning. It will be appreciated that the constancy of the air volume handled by a fabric filter unit largely depends on the condition and cleanliness of the fabric.

Equipment Digest

A recent addition to the range of P.T.F.E. (Polytetrafluoroethylene) products manufactured by Turner Brothers Asbestos Co. Ltd., is pipe thread sealing tape. This unsintered tape is supplied as a continuous ribbon ½ in. wide on handy metal dispensers in lengths of 20 ft., 30 ft. or 40 ft., and is used for sealing threaded pipe joints at a rate never possible with previous materials. Breaking of the connection is easily accomplished, even after a long period of time.

The plasticity of the material ensures that it conforms exactly to the contours of the thread, resulting in a perfect seal against pressures of many thousands of lb./sq. in. It is also unaffected by temperatures ranging from −100 deg C. to +300 deg. C., is chemically inert and will not cause contamination of the liquid being handled. Turners P.T.F.E. tape is impervious to water, steam and most corrosive liquids and gases, and is unaffected by ageing or weathering.

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Precision Electrical Products (Stockport) Ltd., have extended their range of PEP-LOEWE centrifugal pumps by the addition of the Pomona, a general purpose self priming unit. The pump forms a compact portable pumping set and is available complete with either a four stroke petrol engine or electric motor.

The capacity of the pump ranges from 5,000 g.p.h. against a head of 10 ft. to 660 g.p.h. against a head of 89 ft. The self priming capacity amounts to a 22 foot suction lift and once the pump casing has been initially filled the unit is always ready for use. The Pomona is fitted with a semi enclosed impeller which is unaffected by mud, dirt or sand and pumping can be carried out with solid particles in the water of up to ¼ in. dia.

Pumping is the title of a new 12-page illustrated brochure now available from Parkinson Cowan Measurement. The second of a new series of three, this illustrated brochure outlines the construction of the Parkinson Cowan Measurement range of Rotoplunge pumps. This versatile pump, which has only three moving parts, has applications throughout industry and offers more optional features than are available with other pumps. Details of these features and of specimen applications are also included. There is also an interesting section describing the Shoflo sight flow indicator, an effective device which shows at a glance whether liquid is flowing through a pipeline.

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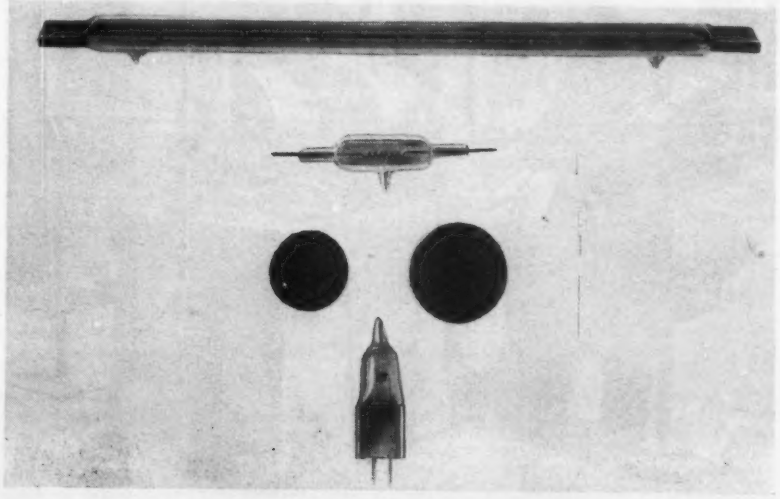
Shown for the first time at the last Electrical Engineers Exhibition, the new 11 kV., 250 MVA General Electric Ltd. ring main unit, Type DDFA, is the subject of *Technical Description No. 471* which is now available from the company's publicity department. Equipped with a fused tee-off circuit capable of controlling circuits up to that of an 11 kV., 1,500 kVA. transformer, it is ideal for urban and rural areas where a tee-off circuit-breaker is not economically justified.

Designed for outdoor and indoor use, the ring main unit comprises two 400 A load-breaking, fault-making oil switches controlling the ring main circuit, with a smaller oil switch, h.r.c. fuses and off-load isolator in the tee-off circuit. To make the replacement of the fuses perfectly safe the off-load isolator disconnects all the fuses from the ring main circuit and connects them to earth. This isolator can only be operated when the tee-off oil switch is in either the " OFF " or " EARTH " position.

First major advance in incandescent electric lighting since the introduction of the coiled coil in the nineteen thirties is claimed for a new miniature iodine-filled filament lamp now being manufactured in Britain. The Osram Lamp Division of the G.E.C., announce that they will be marketing the first of a range of miniature lamps which they claim may revolutionize large-area lighting in the next few years. One of the three forms of iodine lamp in development is a tubular filament in 500, 1,000 and 1,500 wattage for floodlighting and for industrial and arena lighting. This will be available shortly. It is designed to give 15 per cent more light than its convential equivalent. Below are the three forms developed by Osram with size indicated by a penny and a halfpenny



MINING MISCELLANY

Alberta Iron Ore for Japan.—Premier Steel Mills of Edmonton are to open negotiations with Japanese interests for the export of concentrated iron ore from their Peace River, Alta., deposits. Tests have been made by Fuji Iron & Steel, which were found satisfactory, and Premier are to offer about 1,000,000 tons of briquettes annually, equivalent to over 2,000,000 tons of ore.

Iron Ore Mining in Britain.—Mr. G. D. Elliot, general works manager of the Appleby-Frodingham Steel Co., has stated in the United Steel Companies' magazine that iron ore in the group's Midland and eastern reserves is sufficient to last the group's Scunthorpe steelworks for 80 years, at a rate enabling a steel output of 3,500,000 tons a year. This is 1,000,000 tons higher than Scunthorpe's present capacity.

Norwegian-Yugoslav Aluminium Project.—Norway and Yugloslavia are considering the possibility of using Yugoslav deposits of high quality bauxite in Norway's aluminium industry. Mr. Trygve Lie, special economic adviser to the Norwegian Government, and Mr. Aage Owe, director general of the Norwegian State Aluminium Works, have been visiting Belgrade to discuss the project and Mr. Owe has also visited the bauxite deposits in Montenegro, Hercegovina and Dalmatia.

Indian Minerals Recently Discovered.—Some nuclear minerals including gallium and radium have been discovered at Kulihan in the Khetri copper-bearing area in Rajasthan. Samples of gold and silver, discovered at Madaan have been sent to Mysore for analysis. Drilling to a depth of 2,500 ft. is proposed by the Indian Bureau of Mines in the same area, as copper is also believed to occur.

Natural Gas in Nigeria.—It is reported that work will shortly begin on the piping of natural gas to the Trans-Amadi Industrial Layout at Port Harcourt where Shell-B.P. is carrying out an investigation on methods for transporting the gas.

W. German Aluminium Output.—Virgin aluminium smelters in the Dortmund district have been working to capacity in the third quarter of 1961, but demand has abated slightly, owing to manufacturers of semis clearing their stocks.

U.A.R.-Cameroun Trade Agreement.—It is reported from Cairo that the United Arab Republic and the Cameroun Republic have signed an agreement under which U.A.R. imports from the Camerouns will include aluminium ore, in exchange for commodities including cement. During the first year of the agreement trade between the two countries will be over Egyptian £125,000.

An electrolytic grinder (*picture below* shows operator at Hard Metals Ltd.) introduced in South Africa for re-sharpening tungsten carbide-tipped percussion bits of mining drills has lengthened the life of drills by 5-10 per cent, as well as reducing service costs and the time needed for re-sharpening. This result is obtained by the smoother surface produced on the bit by electrolytic grinding. The Diamond Research Laboratory in Johannesburg developed a special plating bath to produce a hard stress-free nickel plating on the vee-shaped edge of the bronze grinding wheel. The nickel plating is impregnated with diamond grit, which acts as an insulator between the drill (anode) and the grinding wheel (cathode). An electrolyte is forced between the wheel and the drill bit, with the result that material is removed from the bit. The diamonds, which project 0.001 in. to 0.003 in. from the wheel, accurately control the size of the gap and also act as scrapers. With the wheel revolving at 6,000 surface f.p.m., grinding time is usually between 20 and 30 secs. and 100 to 150 bits are ground per hour. A single wheel can re-sharpen 40,000 to 100,000 bits

Proposed Molybdenum Tax.—A new tax on the production of the big copper mining companies in Chile is envisaged in a bill submitted to Congress by a Conservative deputy, which provides for a 50 per cent tax on exports of molybdenite and pure molybdenum. The proceeds would be used to finance research in the field of exports of metallurgical ores, as well as for the granting of scholarships for mining engineers and for the construction of market places in various cities. The tax would be calculated on the basis of "average yearly value of the quotations for molybdenum ores in the metal markets of New York and London". It would be payable in dollars, but the Copper Department could authorize payment in other currencies.

Aluminium Plant in Kashmir.—A bauxite development corporation is planned for Kashmir, where deposits estimated at 11,800,000 tons, are available along the Jangalgali coal belt in Raisi tehsil of Jammu Province. The Kashmir Government has approached the Government of India regarding a project for Salal in the same region. Such a plant, with an annual capacity of 10,000 tons of aluminium, would require a capital of Rs. 10 to 12 crores.

Spanish Mineral Production.—Production of barytes in Spain has risen from 7,174 tons a year in 1950 to 25,942 tons in 1960. Fluorspar output has also risen, from 33,167 in 1950 to 111,019 tons in 1960. Bauxite production has dropped, however, during the last 10 years, from 12,186 tons in 1950 to 2,573 in 1960. Quicksilver output in 1960 was 132,000 tons, but tungsten dropped to 913 tons, compared with 5,057 tons in 1959.

U.S. Manganese Outlook.—It is considered possible that the U.S. Government may include about 2,000 s.tons in its next list of metals to be stockpiled.

Grouting in Canada.—Grouting work being done by Cementation Co. (Canada) Ltd., in the shaft of the Potash Co. of America near Saskatoon, Saskatchewan, is now in its final stages. The date at which the mine and concentrator will resume operation has not yet been announced.

New Steel Works in Pakistan.—The Pakistan Government has approved a Rs. 650,000,000 plan for setting up a steel works at Karachi with an annual capacity of 350,000 tonnes. The mill is scheduled for completion by the end of 1965. The Pakistan Government has accepted a proposal submitted by an American firm of furnace manufacturers, Swindell-Dressler Corporation, which will contribute 30 per cent of the capital.

Mesabi Iron Ore Hopes.—Two 20-ton samples of low-grade non-magnetic iron ore from the Western Mesabi range in the United States have been dispatched to Western Germany. The ore will be tested at the Krupp works to determine whether or not it can be used successfully in the Krupp-Renn process, which converts certain low grade ores into high concentrates and iron. If the results of the test are satisfactory, the American licensee for the Krupp-Renn process, Southwestern Engineering Co. of Los Angeles, plans to build a plant in the Itasca, Minnesota, area. The project originated with the Itasca Area Re-development Agency. If the tests are successful, many similar plants might be constructed in the Mesabi Range.

U.S. Aid for Nigeria.—U.S. State Department has announced an aid programme for Nigeria of $225,000,000 to be used for Nigeria's five-year development plan, which starts next April. In this plan, a new steel complex is proposed in Eastern Nigeria, and a Niger Dam project, which will provide hydro-electric power and water for irrigation.

Austrian Aluminium Output Up.—During the first three quarters of 1961, Austria produced some 68,258 tonnes of aluminium, compared with 66,069 tonnes for the corresponding period in 1960.

Development in Cambodia.—Experts from Mainland China are reported to be examining iron ore reserves in the Kompong Thon area of Cambodia. China has granted a further loan, amounting to U.S.$10,600,000 to Cambodia, most of which is for the erection of a small-scale steel works. Poland has already supplied Cambodia with equipment for oil borings.

Norwegian Titanium Project.—National Lead Co., the U.S. titanium and titanium dioxide producer, is reported to be studying the possibility of erecting a plant at the Tellness ilmenite mine in Norway for the production of titanium slag and iron. Titania A/S who opened the Tellness ilmenite mine in October 1960, is a subsidiary of National Lead Co. The projected plant would have an annual capacity of about 600,000 tonnes of ilmenite concentrate, and work to the process of the Quebec Iron and Titanium Corp. of Canada. At present, Tellness concentrate is delivered in unprocessed form to European producers of titanium pigments.

Ontario Gold Mining Areas.—A preliminary report on the geology of the Big Trout Lake-Severn River area in the far northwestern part of the Patricia Portion of the District of Kenora is now available from the Ontario Department of Mines. This area was the scene of gold prospecting between 1935 and 1940.

Yugoslav Copper Merger.—It is reported that the Bor and Majdanpek copper mining concerns are to be amalgamated, as part of a plan to raise the present joint output from 55,000 to 80,000 tonnes.

Venezuelan Iron Production.—Output of the Orinoco Mining Co. will probably be under 12,000,000 tons, compared with 15,000,000 tons in 1960, and output is unlikely to increase in 1962. The reduction is attributed to contraction in the U.S. demand for steel and increasing competition from Canada and Liberia. Total iron ore output in Venezuela for the first nine months of 1961 amounted to 11,300,000 tons compared with 14,800,000 in the same period of 1960.

Venezuelan Mineral Deposits.—The Ministry of Mines has stated that deposits in the Cerro San Isidro area total some 450,000,000 tons with an iron ore content of 63 per cent. Nickel deposits have also been disclosed amounting to 30,000,000 tons in an area at Loma de Hierro in the State of Aragua.

U.S. Copper Summary.—The U.S. Bureau of Mines in its summary of the domestic copper position for the first nine months of 1961, shows a total of 1,054,314 tons, compared with 1,016,071 tons in the same period of 1960.

The $10,000,000 expansion programme at the potash mining project of International Minerals and Chemical Corp. at Esterhazy, Saskatchewan, in Canada's mid-west, will produce approximately 420,000 tons during the first year of production against the present annual output of 150,000 tons worth $4,000,000. In the photograph, published by courtesy of the Canadian National Film Board, are shown storage tanks each 200 ft. dia. and built to hold 35,000 tons of potash. Also shown are the mill, railhead and shaft. The ultimate target at Esterhazy is an annual output of 1,200,000 tons

Company News

A production plant for tantalum and columbitum sheet and foil and tantalum anodes is to be built in Holland as a 50-50 joint venture by N.V. Billiton Mij and the Kawecki Chemical Co. of the U.S., who will supply the technical know-how. The two companies are to set up a joint subsidiary with an authorized capital of Fls. 4,000,000 (£400,000). Construction of the new plant is to start early in the coming year and should be completed in about 12 months. The production range is to be extended as soon as possible. The new joint subsidiary will also act as agents outside the U.S. for Kawecki's other products, which include high purity germanium, arsenic, caesium, gallium and selenium, as well as other Billiton products such as high purity bismuth and indium.

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The Beryllium Corporation, of Reading, Pa. has formed a new, wholly-owned subsidiary, Deutsche Beryllium G.m.b.H., to market its "Berylco" beryllium copper products in West Germany Headquarters of the subsidiary will be at Bad Homburg, near Frankfurt. Besides carrying a complete alloy inventory of beryllium copper products, the new firm will offer slitting, shearing and cutting services.

★

The "Galih" sulphuric acid factory at Sepandjang, East Java, a nationalised Dutch enterprise operated by the East Java branch of the State undertaking, B.A.P.P.I.T., produces three tons of sulphuric acid daily using raw sulphur from East Java and West Java. Indonesia's Eight Year Plan calls for increased production by "Galih" to 1,000 tons of sulphuric acid daily. According to *Mineral Trade Notes*, plans have been approved by the National Planning Council for construction of a 25 t.p.d. plant as part of the initial phase of the Eight Year Plan.

★

Beryllium buttons derived from the low grade Topaz Mountain deposits in Utah were shown in New York by Vitro Minerals Corp., a jointly owned subsidiary of Vitro Corp. and the Rochester and Pittsburgh Coal Co. The buttons were made at the U.S. Bureau of Mines Metallurgy Research Centre in Albany, Oregon, by first reducing concentrated oxide to sponge followed by arc melting. It is understood that no decision to go into commercial production has yet been made. Berylco and Brush have also produced metals from complex U.S. domestic ores, but apparently the processes are not yet ready for large-scale commercial production.

★

America's "Project Gnome" shaft and tunnel at Carlsbad, New Mexico, where a five-kiloton atomic device has been triggered off, was the work of the American subsidiary of The Cementation Group. The contract, which was part of the American Atomic Energy Commission's programme for experiments in the peaceful uses of atomic energy, was started by The Cementation Company of America Inc., in June 1960, and finished in August 1961, one month ahead of schedule.

★

An order from the East Pakistan Water and Power Development Authority for fifteen crawler-mounted draglines and three truck-mounted cranes, which has been received by NCK-Rapier, is valued at over £260,000 The machines are being made by Newton Chambers and Co.

★

The International Harvester Co. of Australia has won a contract from Singapore to supply 35 small earth-moving machines and more than 30 bulldozer blades, at a total cost of over £A66,000. This company has sent £A19,250,000 worth of machinery, to 81 countries, in the first 10 months of 1961.

★

Following the recent acquisition of certain of the interests of the Pulsometer Engineering Co. Ltd. by G. & J. Weir Holdings Ltd., the products of Joseph Evans and Sons (Wolverhampton) Ltd. are now being marketed by G. & J. Weir Ltd., principal manufacturing subsidiary of the Weir Group.

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Metals and Minerals

Developments in Aluminium Reduction

The British Aluminium Co., a subsidiary of Tube Investments, and Kaiser Aluminium and Chemical Corp. have jointly developed a modified type of aluminium reduction cell in which refractory hard metals are used as essential elements. According to a joint announcement by Lord Plowden, chairman of British Aluminium, and D. A. Rhoades, president of Kaiser Aluminium, this development is considered to be of major commercial significance because it can substantially reduce the production cost per lb. of aluminium, besides permitting expansion of the capacity of existing facilities with relatively small capital expenditure.

The new method, it is stated, can lead to an improvement of up to 15 per cent in cell operation, which can be achieved either by a decrease in the energy consumption per lb. of metal, or by an increase in metal output per pot. Both companies are currently using the new type of reduction cell in certain of their reduction facilities. They claim that this development represents the first basic change in the electrolytic reduction process for aluminium since its invention 75 years ago. It is planned to continue making refinements in its application to existing cells.

Further details of the development are to be given in a paper to be presented at the International Symposium on the Extractive Metallurgy of Aluminium, which will be held by the American Institute of Mining, Metallurgical and Petroleum Engineers in New York City as part of its annual meeting in February, 1962.

North American and Continental producers continue to observe a veil of secrecy regarding the progress currently being made in the utilization of the Gross process, which is a "direct" method of producing aluminium from bauxite without the intermediary stage of converting the ore into alumina. This process was developed at the Fulmer Research Institute, Stoke Poges, Buckinghamshire, under the sponsorship of Aluminium Ltd., and is fully protected by patents. Alcan is constructing an 8,000 ton plant for further tests, but it is believed that the company will not be ready to proceed with a full-scale venture until its unfinished conventional facilities at Kitimat are in production. Péchiney has had a 5,500-tonne pilot plant in operation since early this year, but to what extent the direct method will be used in the construction of its own new facilities has not been revealed.

The advantages claimed for the Gross process are a saving in the capital cost of new facilities and also some lowering of reduction cost, but it is generally believed that the economies so effected would not be large enough to warrant the replacement of existing facilities. For these reasons it looks as though the first commercial plant to employ the new method may be the new 55,000-tonne smelter which is to be constructed by the Nippon Light Metal Co. at Sumizu in Japan. Nippon is half-owned by Aluminium Ltd. and has been licensed to use the process.

On the results of operations to date, Péchiney estimates that on a volume basis reduction costs could be reduced below current levels by as much as 20 per cent. Nippon is said to be counting on a saving of about 15 per cent. This could be an important and possibly decisive advantage if the time comes, as eventually it surely must, when domestic production of primary ingot catches up with Japan's rapidly expanding consumption, and a surplus becomes available for export.

Looked at from the wider standpoint of aluminium's own future prospects, the savings likely to be effected in future years by such revolutionary developments as the Gross process and the new reduction cell should be of inestimable value in the struggle for markets, many of which are becoming increasingly competitive as time goes on.

U.S. ALUMINIUM EXPORTS FALL

A substantial increase in shipments to domestic customers, accompanied by a sharp decline in exports, netted the United States aluminium industry a modest recovery in 1961 from the generally lower business levels of 1960, Mr. R. S. Reynolds, president of Reynolds Metals Company, has stated in a year-end review.

He said final figures should show shipments to U.S. customers were up about ten per cent over 1960. Exports, which represented 13 per cent of total shipments in 1960, would be about 50 per cent lower.

The decline in foreign shipments was mainly in ingot while the domestic gain was largely fabricated and semi-fabricated products. Total 1961 shipments, both domestic and export, would be about 2,400,000 tons, a three per cent increase over the 2,332,000 tons shipped in 1960.

Imports from Europe and Japan, although comparatively small, have had some effect on domestic markets. In many cases, foreign producers have been able to deliver semi-fabricated metal to any part of the United States at prices below the domestic market. Low tariffs of 1.25 cents on ingot and 2.5 cents on semi-fabricated items have been no obstacle to the cheaply produced or government subsidized metal from abroad, Mr. Reynolds said.

★

During the third quarter of 1961 domestic bauxite production was 316,000 long tons, according to the U.S. Bureau of Mines. The production rate was about the same as that for the first two quarters of the year. The total production for the first nine months of this year was 42 per cent less than the same period of last year. Arkansas produced 95 per cent of the total.

The third quarter imports of 2,360,000 l.tons were the largest that have been recorded and represented an increase of 14 per cent compared with the second quarter imports. Total imports for nine months were approximately the same as in the comparable period of 1960. Imports from Jamaica were up 14 per cent over the second quarter and supplied 57 per cent of the total imports. Surinam imports increased 29 per cent and Dominican Republic imports increased 19 per cent. British Guiana and Haitian imports decreased 52 per cent and 44 per cent, respectively.

★

Electrical transformers with windings of aluminium strip are being manufac-

LONDON METAL AND ORE PRICES, DECEMBER 28, 1961

METAL PRICES

Aluminium, 99.5%, £186 per ton
Antimony—
English (99%) delivered, 10 cwt. and over £230 per ton
Arsenic, £400 per ton
Bismuth (min. 1 ton lots) 16s. lb. nom.
Cadmium 11s. 6d. lb.
Cerium (99%) net, £18 0s. lb. delivered U. K.
Chromium, Cr. 99% 6s. 11d./7s. 4d. lb.
Cobalt, 12s. lb.
Germanium, 99.99%, Ge. kilo lots 2s. 5d. per gram
Gold, 250s. 2d.
Iridium, £20/£23 oz. nom.
Lanthanum (98%/99%) 15s. per gram
Magnesium, 2s. 2¼d./2s. 3d. lb.
Manganese Metal (96%/98%) £275/£285
Nickel, 99.5% (home trade) £660 per ton
Osmium, £17/£22 oz nom.
Osmiridium, nom.
Palladium, Imported, £8 12s. 6d.
Platinum U.K. and Empire Refined £30 5s.
Imported £27 7s. 6d./£27 17s. 6d.
Quicksilver, £59 ex-warehouse
Rhodium, £43/£45 oz.
Ruthenium, £14/£16 oz. nom.
Selenium, 41s. 0d. per lb.
Silver, 87¾d. f. oz. spot and 88½d. f'd.
Tellurium, 37s. 6d. lb.

ORES AND OXIDES

Antimony Ore (60%) basis		28s. 0d./30s. 0d. per unit c.i.f.
Beryl (min. 10 per cent BeO)		270s./275s. per l. ton unit BeO
Bismuth		30% 5s. 0d. lb. c.i.f.
		20% 3s. 3d. lb. c.i.f.
Chrome Ore—		
Rhodesian Metallurgical (semifriable 48%)	(Ratio 3 : 1)	£15 5s. 0d. per ton c.i.f.
„ Hard Lumpy 45%	(Ratio 3 : 1)	£15 10s. 0d. per ton c.i.f.
„ Refractory 40%		£11 0s. 0d. per ton c.i.f.
„ Smalls 44%	(Ratio 3 : 1)	£13 5s. 0d. per ton c.i.f.
Pakistan 48%	(Ratio 3 : 1)	£11 15s. 0d. per ton f.o.b.
Columbite, Nigerian quality, basis 70% combined pentoxides (Ratio 10:1) $Nb_2O_5 : Ta_2O_5$		150s./160s. 0d. per l. ton c.i.f. nom.
Lithium Ore—		
Petalite min. 3½% Li_2O		50s. 0d. per unit f.o.b. Beira
Lepidolite min. 3½% Li_2O		80s. 0d. per unit f.o.b. Beira
Amblygonite basis 7% Li_2O		75s. 0d./85s. 0d. per ton f.o.b. Beira
Magnesite, ground calcined		£28 0s./£30 0s. d/d
Magnesite Raw (ground)		£21 0s./£23 0s. d/d
Manganese Ore Indian—		
Europe (46%-48%) basis 60s. 0d freight		73d./75d. c.i.f. nom.
Manganese Ore (43%-45%)		69d./71d. c.i.f. nom.
Manganese Ore (38%-40%)		nom.
Molybdenite (85%) basis		10s. 0d. per lb. (f.o.b.)
Titanium Ore—		
Rutile Australian 95/97% TiO_2 (prompt delivery)		£31/£31 10s. per ton c.i.f.
Ilmenite Malayan 50/52% TiO_2		£11 10s per ton c.i.f.
Ilmenite Travancore 58/60% TiO_2		£15/£15 10s. per ton c.i.f.
Wolfram and Scheelite (65%)		97s. 6d./102s. 6d. per unit c.i.f.
Vanadium—		
Fused oxide 95% V_2O_5		7s. 6d./8s. per lb. V_2O_5 c.i.f.
Zircon Sand (Australian) 66-67% ZrO_2		£16/£16 10s. ton c.i.f.

tured in the U.S. by the Delta-Star division of H. K. Porter & Co. In switching from copper wire to aluminium strip for the low voltage winding, the company developed a new rectangular core design said to eliminate mechanical stress and to provide maximum magnetic performance. It is claimed that the new units can withstand short circuit currents of more than 50 times rated current; hence transformer weight is reduced, hot spots are reduced, and the insulation has longer life. This development is regarded as a major step in opening up an important new market for aluminium.

★

The Aluminium Company of America is now producing super-purity aluminium in the range 99.95-99.99 per cent.

QUICKSILVER OUTLOOK REMAINS UNCERTAIN

The outlook for quicksilver remains clouded by the uncertainty as to how much Russian and Chinese metal will arrive on the U.K. market in 1962. Since Russia re-entered the market towards the end of 1960 some 6,034 flasks had arrived by the end of October, 1961. More recently Chinese quicksilver re-appeared in the U.K.—some 304 flasks arriving in September and 122 in October. The price for the Chinese metal has been mentioned at about £55 c.i.f.

There has been talk, however, in the market that much bigger quantities of Chinese metal will be shipped in 1962—possibly running into several thousand flasks. Assuming that 5,000 flasks is the minimum brought in and that Russian deliveries remain at much the same rate as previously, the total represents a very large proportion of the U.K.'s yearly imports from all sources. In the ten months ended October 31 the U.K. imported about 23,163 flasks and re-exported well over 6,000 flasks.

Meanwhile, the market remains steady with the London ex-warehouse price quotably unchanged at £59 a flask. This stability, which has now lasted about a month, has been assisted by the unwillingness of Spain and Italy to compete at present lower prices and the fact that spot supplies available from other sources are said to be firmly held despite an unimpressive demand.

The industrial consumption of quicksilver in the U.S. during the third quarter of 1961 rose 31 per cent over the second quarter to 16,200 flasks, the highest since April-June 1959, according to the U.S. Bureau of Mines.

Mine production of quicksilver July-September fell to 7,220 flasks, per cent less than in April-June and the smallest since the first quarter of 1960.

General imports of quicksilver were 56 per cent greater than in the second quarter. Exports totalled 109 flasks and re-exports 40 flasks.

★

Italian quicksilver exports during the first ten months of 1961 totalled 958.7 tonnes, compared with 1,491.9 in the same preiod of 1960, according to the Instituto Centrale di Statistica.

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Salem Magnesite Private Ltd. plans to mine 180,000 tons of magnesite in 1962. This tonnage will meet all domestic requirements and leave a substantial ton-

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nage, maybe as much as 50,000 tons, for export.

Production of magnesite in India totalled 156,332 tonnes last year against 157,967 tonnes in 1959. According to *Mineral Trade Notes*, about 98 per cent of the 1960 output was from the Salem district of Madras State, where the magnesite reserve is estimated to be 82,500,000 tonnes to a depth of 100 ft. and 330,000,000 tonnes at 500 ft. Deposits of magnesite discovered in the Almora district of Uttar Pradesh are estimated to contain 4,000,000 tonnes of high-grade ore.

AUSTRALIAN RUTILE

The Australian rutile shipment market ends 1961 on a firm note in the range £30 10s. to £32 per long ton c.i.f. Europe for minimum 95 per cent material for shipment in 1962 compared with £30 to £31 recently.

Around the middle of this year prices were down to £20, then recovery from these uneconomic levels began and the pace quickened two or three months ago on the widespread belief that the U.S. Du Pont was considering a long-term purchase of a minimum of 30,000 tons annually from Australia. Since then it is known that several Australian producers have been in the U.S., although nothing definite has yet emerged.

A contract on these terms, which later might be stepped up to 50,000 tons a year, would help considerably to sustain the market. Most of Australia's production is exported, and shipments have been in the region of 80,000 tons a year. But rated production capacity is reckoned to be about 140,000 tons. Even so, a guaranteed outlet of up to 50,000 tons a year represents a sizeable proportion of rated capacity.

Despite seasonal considerations, the level of enquiry and resulting business has been quite good, with the U.K., the Continent and Japan participating. New demand from the U.S., however, has been slow to develop, although a few enquiries have been circulating from the rod makers there.

WOLFRAM ORE MARKET

The recovery in wolfram ore shipment prices from the recent low of around 90s. per long ton unit c.i.f. Europe continues, and dealers now indicate a range of from 97s. 6d. to 102s. 6d., a rise of 2s. 6d. from previous levels. Demand has been rather selective but overall the general consensus of opinion is that a fair amount of ore has changed hands. Most of the business has been on European account with the Continent probably buying more than the U.K. To a lesser extent the U.S. has also bought abroad, but demand from that country for foreign supplies is determined by the level of domestic production. At recent low levels some mines may have found it uneconomic to carry on for the time being. Japan is understood to have been out of the market because of lack of funds.

Whether prices continue to make further headway in the New Year is problematical. Consumers in many instances have probably covered themselves for the time being, while there remains the question of at what level the Board of Trade will re-enter the market. When prices were falling they withdrew when a level of around 125s. was reached.

It is generally thought that the B.O.T. might make available supplies if the price climbed back to that figure. Even so the impact on the market would not be as heavy as it might be since it is believed that most of the Department's holdings now comprise off-grade material.

BIG RUSSIAN COPPER DEAL WITH CHILE EXPECTED

Because of rising shortages of copper in the U.S.S.R. which could hold up the Soviet industrial development schemes a contract for the delivery of 300,000 tonnes of Chilean copper is expected to be signed shortly in Santiago by Mr. Drobiasko, head of a Soviet Trade Mission now in Santiago.

The contract is believed to be for 60,000 tonnes annually over the next five years which will include 35,000 tonnes of copper bars and 25,000 tonnes of electrolytic wire.

Dr. Luis McKenna, the Chilean Finance Minister, said on Wednesday that the Russians had offered to pay in dollars for copper bars, plus a barter contract for semi-processed metal. However, it appears that the Chilean Copper Department is standing by its demand that all payments for Chilean copper should be made in hard currency.

CHROME ORE

Activity in the U.K. chrome ore market in the past few weeks has been reasonably satisfactory, according to trade sources. It appears that business has been largely confined to fixing up contracts for delivery of ore during 1962 with the U.K., the Continent, Japan and

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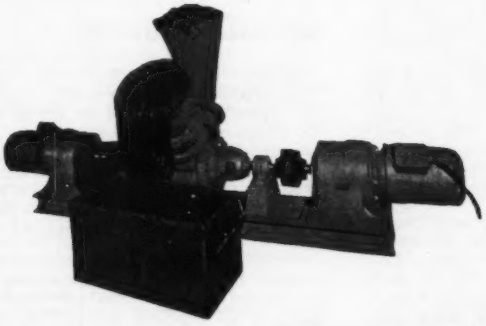

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to a lesser extent, the U.S. It is understood that these contracts have been negotiated on the basis of existing prices, thus, Rhodesian material, 48 per cent, three to one ratio, remains at £15 5s. per ton c.i.f. U.K.

Prices have been at a depressed level for a long time and presumably the general level of demand is insufficient to impart a hardening tendency, especially as supplies are said to be adequate. Competition from Russia is still being encountered but some of this ore is nevertheless unsuitable for buyers' requirements.

VALUE OF U.S. STOCKPILE FALLS

The U.S. stockpile of strategic materials, mostly metals, has again fallen in value and is now worth $5,678,000,000 at current market prices, states the Office of Emergency Planning in a report to Congress. The report covers the principal activities in stockpile planning and operations in the first six months of 1961.

Seventy-six materials appeared on the stockpile list as of June 30, 1961. Maximum objectives were equalled or exceeded for 52 materials and basic objectives for 62 materials. Additional quantities in other government inventories, if added to the strategic stockpile, would change these totals to 63 for maximum objectives and 69 for the basic objectives.

Materials valued at approximately $3,212,000 were delivered to the strategic stockpile as a result of previous commitments, including repayments on foreign aid development loans. Of this amount $1,754,400 was applicable to the strategic stockpile objectives as of June 30. Purchase commitments entered into during Jan.-June, 1961, for additional materials for the strategic stockpile were valued at $274,000. Materials still on order were valued at $4,619,000, of which amount $896,500 was applicable to stockpile objectives. In addition the processing cost of contracts executed for the upgrading of government-owned materials amounted to about $3,200,000.

Sales commitments for the disposal of off-grade and excess materials from strategic stockpile and D.P.A. inventories during the six months period totalled about $27,345,000, of which approximately $13,917,000 represented disposals from the strategic stockpile.

U.S. IRON ORE CONSUMPTION

In October this year the U.S. consumed 9,680,672 gross tons of iron ore. This represented a gain of about 700,000 tons over the September figure and of nearly 3,000,000 tons over the corresponding figure for last year. At 79,121,456 tons, however, consumption during the 10 months ended October 31 was about 10,900,000 tons lower than in the corresponding period of last year. Total stocks at furnace yards and docks in the U.S. amounted on October 31 to 73,600,000 gross tons and were equivalent to more than six months' supply at the October rate of use. Despite an increase of 2,700,000 tons during October they were 4,000,000 tons lower than the figure recorded twelve months previously.

Copper · Tin · Lead · Zinc

(From Our London Metal Exchange Correspondent)

Stocks in L.M.E. official warehouses at the beginning of the week were higher in the case of copper and lower in the case of tin, lead and zinc.

RECORD U.S. COPPER OUTPUT IN 1961?

Copper stocks in L.M.E. official warehouses have risen in the past two weeks by 1,158 tons to 16,807 tons. On the L.M.E. prices have not varied greatly whilst the contango has widened 5s. and is now 20s. to 25s. Activity has been quite good in spite of the holidays, although influential support has been noticeable when prices have tended to fall.

Unconfirmed reports from Santiago state that the workers at Chuquicamata have voted by an overwhelming majority to strike from January 1, whilst trouble appears possible at El Teniente, where the company has decided to pay a much reduced end of year bonus. The market, however, is watching the position both in Chile and in Katanga with some apprehension.

Advices from New York indicate that the slow pace of copper buying in America during December has been influenced by tax and balance sheet considerations. Overall, consumers inventories are said to be high, and on this account it is thought that new orders are likely to be spread over the January/March period with emphasis on March deliveries. In Washington the Bureau of Mines has estimated that production of copper at U.S. mines in 1961 will be 5 per cent higher than in 1960 and exceed the peak output reached in 1956. The following figures (in tons) for November, October figures in parentheses, have been issued by the Copper Institute in New York :—

Inside U.S.A.

Refined Production	141,201	(145,425)
Domestic deliveries	122,446	(130,364)
End month stocks	77,646	(76,785)

Outside U.S.A.

Refined Production	172,611	(176,710)
Deliveries fabricators	197,459	(189,430)
End month stocks	332,894	(336,451)

The U.S. Copper Association has given U.S. domestic consumption of copper by brass mills and foundries in November as 124,275 s.tons compared with 126,250 s.tons in October.

I.T.C. TO MEET IN JANUARY

Tin stocks in L.M.E. official warehouses have fallen in the past two weeks by 95 tons to 4,087 tons. On the L.M.E. prices have fallen by about £10 for cash and £6 10s. for forward metal, with a widening of the contango to about £14 owing to the falling due of stale bull positions, which should alter in the new year. The market now awaits some official statement as to whether or not there are to be releases from the U.S. stockpile, and if so, on what price basis.

Meanwhile, as indicated in our issue last week (page 647) the I.T.C., will meet in the second week of January, with a view to allowing the present agreement to continue on a provisional basis until the end of June. Statistics issued by the I.T.C. show that in October, production of tin in concentrates in Malaya rose to 4,906 tons from 4,580 tons in September, whilst Bolvian production rose to 1,868 tons in September from 1,594 tons in August. In Indonesia production dropped to 1,583 tons in September from 1,7[illegible] tons in August and in Nigeria prod[illegible]tion fell to 651 tons in October fr[illegible] 768 tons in September. Smelter produ[illegible]tion in Malaya/Singapore, the U.K. and Belgium in October (September figures in parentheses) was 5,578 tons (5,795 tons), 1,965 tons (2,282 tons) and 304 tons (538 tons) respectively.

On Thursday the Eastern price was equivalent to £952½ per ton c.i.f. Europe.

LEAD-ZINC STUDY GROUP TO MEET IN MARCH

Lead stocks in L.M.E. official warehouses have fallen in the past two weeks by 898 tons to 9,931 tons. On the L.M.E. prices of both cash and forward metal have remained steady with a contango of 20s. to 22s. 6d. Total lead production in O.E.C.D. countries in November has been given as 72,884 tons (provisional) compared with 67,006 tons in October; total stocks of refined lead for these two months were 56,125 tons (provisional) and 50,422 tons respectively.

It is understood that the Lead Zinc Study Group will hold its next meeting in Geneva in the middle of March. Of interest is a report that a lode of high grade lead and silver ore, which may prove to be the biggest in Europe, has been discovered in Western Ireland (See *M.J.*, December 22, 1961, page 647).

Zinc stocks in L.M.E. official warehouses have fallen in the past two weeks by 39 tons to 10,977 tons. On the L.M.E. prices have not varied greatly and the contango remains at about 20s. to 22s. 6d. There has been little interest to influence prices of this metal, although some trade quarters consider the market position to be sound and consumption prospects encouraging.

New York advices describe present demand as routine and report that the New Jersey Zinc Co. has announced resumption of mining at its sterling mine at Ogdensburg which has been closed since August 1958. The mine is expected to reach its capacity of 1,000 tons of ore a day within one year.

OFFICIAL TURNOVERS

Official turnovers (in l.tons) for the week ending December 22, 1961, with the previous week's figures in parentheses, are :—

Copper	11,375	(15,475)
Tin	1,500	(2,100)
Lead	5,725	(7,150)
Zinc	6,050	(8,825)

Closing prices are as follows :

	December 14 *Buyers*	*Sellers*	December 28 *Buyers*	*Sellers*
COPPER				
Cash	£231½	£231¾	£228½	£229
Three months ..	£231½	£231¾	£229½	£230
Settlement ..	£231½		£229	
LEAD				
Current ½ month	£60½	£60¾	£59½	£60
Three months ..	£61¼	£61½	£60½	£61
TIN				
Cash	£950½	£952	£937	£938
Three months ..	£960½	£961	£951	£953
Settlement ..	£952		£938	
ZINC				
Current ½ month	£71½	£71½	£71½	£71½
Three months ..	£72½	£72½	£72½	£72½

Mining Finance

Looking Back On 1961

From the point of view of the mining share market, 1961 has not provided any major surprises, though there has certainly been a number of disappointments. The year opened with a considerable amount of bullishness in the air about the question of the gold price and most of the South African gold shares were standing at levels that have not since been realized on the London market. A minor peak was reached in the October of 1960 and this level was more or less held across the new year into February when President Kennedy made it perfectly clear in his economic messages that he was determined to "defend the dollar".

With this news the Kaffir market began to slide back and the process was hastened by South Africa's withdrawal from the Commonwealth in mid-March. The lowest point was reached in May when *The Financial Times* gold share index was in the low fifties. Shortly after this low point South Africa introduced exchange control regulations and effectively isolated the Johannesburg stock exchange. In the Republic the general condition rapidly became one where rather too much money was chasing too little scrip, prices began to rise and this has been the general trend throughout the rest of the year.

Today the shares have almost returned to the level of twelve months ago and from the Johannesburg standpoint this is a healthy condition, as it is not a function of a gold price spree.

Operating under conditions of exchange control it was unlikely that London would follow Johannesburg but undoubtedly the stability of that centre has been reflected in London, although the market has been extremely narrow for some time. *The Financial Times* index is now about 62 compared with 75 this time last year.

The coming year holds two large questions for the Kaffir market, the gold price as always and the removal of the exchange control regulations. For London these are both bull points; however for Johannesburg this is not, in the short term, necessarily so. Whilst it seems certain that London would rise with the removal of the controls it is unlikely that it would go all the way to the Johannesburg level.

Is it, in fact, likely that the controls will be removed in 1962? Quite possibly not, but the general trend of the South African foreign reserves is such that significant relaxations should be possible. The basic reasons for an increase in the price of gold are as valid in January 1962 as they were twelve months earlier but it must be admitted that there are no clear signs that a change is imminent.

At the beginning of the year it seemed obvious that 1961 was to be the year for tin shares and, whilst some of the wilder hopes have not materialized, this has been so. The tin share section of the London market has shown greater gains than any other, on average the eastern shares have gained by 59 per cent. Individual shares in the property section have made better advances than any individual tin share but as a section tin is unrivalled. Kent (F.M.S.) showed a gain of 176 per cent and Hong Kong 151 per cent. As a group the Nigerian tins have not joined this boom which has been lead throughout by Singapore.

Looking to 1962 it is difficult to predict a trend for tin shares. The metal itself is bound to advance, by how much will depend largely upon the United States. In the stock market, however, this rise has already been discounted and the movements are therefore less certain.

The copper section, particularly Central Africa, has been controlled throughout the year by political considerations and whilst the metal position is better now than it has been, it appears that politics will continue to be the controlling influence in 1962. Over the past twelve months all of the Rhodesian coppers have lost but in most cases the fall has been marginal. Unfortunately this is not true of the Congo, Tanks have lost almost 30 per cent.

London Market Highlights

The days immediately before and after the Christmas Holiday are generally a time when investment interest is at a low ebb and activity on the London Stock Exchange is thus as much devoted to the usual festive convivialities as it is to stocks and shares. But Kaffirs are often a particularly firm market at this time. Few holders are keen to sell in the thin trading conditions and there are always those who think that buying opportunities occur at such times.

But there was no firmness in Kaffirs this year. The ever-present bogey of racial unrest in South Africa reared its head when news of bomb incidents in Johannesburg and Port Elizabeth became known. Prices obeyed this dominating market factor and were quickly marked down, despite the fact that selling was very light. It was a salutary reminder of the importance of politics in the Kaffir section; a period of racial "peace" such as we have had in recent months will allow the other market factors — nearly all of them bullish — to promote a recovery, but any racial unrest will override all other considerations.

Losses on the Monday of the pre-Christmas week were widespread and severe, extending to 5s. in the case of Western Holdings which closed at 123s. 9d. after having been only 122s. 6d. at one time. It is worth noting, however, that this stock has recovered from a low point of 101s. 3d. during the past few months.

In the finance group, Gold Fields dropped 3s. to 65s. and Union Corporation came back 2s. 6d. to 59s.; respective lows for the year for these stocks were 43s. and 40s., striking evidence of the way in which finance issues have led the recent recovery movement. After this shake-out, prices steadied until Thursday when news of a further bomb incident produced another setback in which losses extended to 2s. or so.

In the copper section, share prices of Tanganyika Concessions and Union Minière showed a remarkable resilience during the Katanga troubles. After falling by 5s. to £9 on news that United Nations' forces had "occupied" the Elisabethville headquarters of Union Minière, the shares of the copper complex later rallied sharply to £9¼: "Tanks" regained 1s. to 19s. 6d. The Rhodesian issues were little changed for the most part. R.S.T. and Roan setled down at around 10s. 6d. and 5s. respectively when the earlier merger excitement faded away.

Tin shares eased for a while in sympathy with a fall in the metal price but began to pick up later when some modest investment demand began to appear from local sources. Singapore did little other than to offer occasional small parcels of stock. Yield considerations promoted a jump of 1s. to 14s. 6d. in Pengkalen and buyers were about for such leading issues as Gopeng (41s. 6d.), Southern Malayan (30s. 3d.) and Sungei Besi (44s.). There was no change in Temoh at 3s. 6d. following news of the two-for-one share offer from Mr. Barney Pike's Raybar Holdings.

BY-PRODUCTS AT RUSTENBURG

By-product metals have always been important to Rustenburg Platinum but as a result of the company's production policy increased quantities of by-product metals became available for sale during the financial year ended August 31, 1961.

The platinum "pipe-line" is particularly long and as a result a period of normally a year elapses between the actual mining of ore and the production of refined metal in a marketable form. Conscious of the fact that this situation could produce violent fluctuations in the metal price in times of shortage, the company increased its production during the year 1959/60 in order to build up sufficient stocks to meet such surges in demand as may occur from time to time. The period of high production is now over and at present production is being stabilized at an appropriate level.

Although it was necessary to place the additional platinum to stocks, the additional by-product metals produced have been available for sale and as a result there was substantial increase in revenue from this source during the past year. This increase more than off-set the reduced revenue from platinum, which resulted mainly from the lower demand in the United States, and the net profit from sale of metals increased by R186,440 to R7,061,756. This increase is not reflected in the net profit, however, due to a substantial rise in the provision for taxation.

This increase in taxation is due to a decrease in the amount of capital expenditure ranking for redemption allowance for tax purposes and an increase in the "State's share of profits". During the past year there has been an increase in the scale of mining operations in the company's lease area as distinct from the original claim area.

It is anticipated that there will be a further slight increase in this charge during the current year.

The directors anticipate that the quantity of by-product metals will decrease during the current year as a result of the gradual reduction in production but following this reduction the working cost should also be reduced. There appears to be little change in demand for platinum. The actual tax position for the current year is difficult to assess for though the lease payment will probably increase it is anticipated that the allow-

ance for capital expenditure will be greater.

TIN PROSPECTING

In his annual address to the shareholders of Sungei Besi, Mr. Simms has referred to the prospecting activities of the Tronoh-Malayan group. In Malaya the groups prospecting work, in common with other companies, has disclosed uniformly unfavourable results. However, in Thailand it is expected that a mining lease will shortly be issued covering the area that has been proved suitable for dredging by Tromal Prospecting off the coast of Thailand. The proved area of some 1,234 acres contains 27,500,000 cubic yards at an average tin content of 0.61 lb. per cubic yard.

In Cornwall the prospecting at Cligga, in the St. Agnes district, has continued and one lode intersection has disclosed encouraging tin values. Additional holes are now being drilled in order to make further intersections along the anticipated line of strike. Should the results justify it, then it is planned to deepen an existing shaft by some 350 feet and to then make a more detailed examination by driving and crosscutting.

C.D.M. DIVIDEND

The final ordinary dividend for the year ending December 31, 1961 has been declared at R1.50 bringing the total for the year to R2.00. This is the same payment as the previous year. After providing for taxation the estimated profit for the year has been increased by R4,563,000 to R25,696,000. The provision for taxation amounted to R10,821,000.

RHODESIAN DIVIDENDS

An interim dividend has been declared by Nchanga at the same net level as 1960, due to the increase in Rhodesian taxes; however, the gross declaration is larger. In 1960 the interim was 2s. 4.8d. which after taxation was equivalent to a net dividend of 1s. 6d., this year the interim is 2s. 6d. and is also equivalent to 1s. 6d. net.

Rhodesia Broken Hill has also increased its interim dividend from 4.8d. to 5.0d.; after taxation the net payment remains unchanged at 3d. per unit of stock.

CONGO UP TO DATE ON PAYMENTS

Somewhat to the surprise of security dealers in New York it has been announced that the Central government of the Congo (Leopoldville) is to pay the two past-due semi-annual payments on its $5,000,000 5½ per cent bonds. The payments, which total $787,500, are to be made immediately against the coupons that fell due on April 1, and October 1.

The securities were originally floated in 1958 when the Congo was a Belgian colony and the purpose of the bonds was to finance a building programme as part of a ten-year development plan. They do not bear the guarantee of the Belgian Government.

SOUTH AFRICAN DIVIDENDS

Looking through the complete list of the South African dividends, the Christmas 1961 season can hardly be described as exciting. The Gold Fields and Central Mining dividends have now been announced and are summarized in the table below. The brightest results are those of West Driefontein and Libanon where over the full year the payments have been increased by 13 per cent and 42 per cent respectively.

Company	*June 1960*	*Dec. 1960*	*June 1961*	*Dec. 1961*
	cents			
Blyvoor ..	12.5	13	13	13
City Deep ..	6.25	7	7	7
Cons. Main Reef	15	15	15	15
Corner House Inv.	—	6	—	6
Crown Mines ..	20	20	20	15
Doornfontein ..	15	14	13	12.5
Durban Rood'p'rt	15	15	15	15
East Rand Pty. ..	17.5	15	10	10
Libanon ..	3.75	4	5	6
Rand Mines ..	30	30	25	25
Venterspost ..	10	10	10	10
Vlakfontein ..	9.16	11	10	10
West Drie ..	26.25	29	31	31
West Wit ..	18.75	20	20	20

Rio Algom has become the principal company in Rio Tinto's Canadian organisation for purposes of investment, exploration and administration.

As a result of the direct and indirect purchases of shares in Rio Algom itself and in Preston Mines the beneficial interest of Tinto Holdings in Rio Algom is now 52.8 per cent, this includes the option on 500,000 Rio Algom shares. Tinto Holdings is a wholly-owned subsidiary of Rio Tinto.

Lake View and Star.—In the note published on December 15, page 641, the gold premium and dividend was inadvertently given in Australian currency. These figures should have been in sterling and are £10,054 and 2s. 6d. respectively.

GEOLOGISTS

(1) MINE GEOLOGIST required for a copper mine in Uganda. Duties include underground mapping, structure studies and general supervision of diamond drilling, development headings and stoping in a complicated orebody. Previous underground experience essential.

(2) FIELD GEOLOGIST required for exploration project in Uganda.

Remuneration for both posts dependent on qualifications and past experience. Passages paid, generous leave conditions. Twenty-four and eighteen month tours dependent on marital status. Apply giving full details of experience, age, marital status and copy references to Personnel Manager, Kilembe Mines Limited, P.O. Box 1, Kilembe, Uganda, East Africa.

Tin Company Outputs and Dividends

Company	*Financial year end*	*Tons of Tin Concentrates produced: This financial year to date*	*Last financial year to date*	*Last financial year TOTAL*	*Dividends declared‡: This financial year to date*	*Last financial year TOTAL*
EASTERN						
Ampat	Dec.	608·0 (11)	804·3	879·3	—	3·72d.
Austral	June	537·0 (3)	502·0	2060·5	—	5/-
Ayer Hitam ..	June	315·0 (3)	637·8	2385·0	7·5d.*	2/-
Berjuntai	April	2035·3 (7)	1521·5	2726·8	—	(s) 2/-
Chenderiang ..	March	125·8 (6)	110·5	251·8	—	7·5d.
Gopeng Cons. ..	Sept.	2071·8 (12)	1467·3	1467·3	—	3/3d.*
Hongkong Tin ..	Sept.	621·5 (12)	304·3	304·3	—	—
Idris H.	Dec.	253·5 (9)	224·8	339·3	4·5d.*	1/6d.
Ipoh Tin	March	61·8 (6)	200·3	245·8	—	—
Kampong Lanjut ..	March	1293·3 (8)	1309·5	1948·3	—	—
Kamunting ..	March	1098·0 (8)	902·0	1591·8	—	2/6d.
Kent (F.M.S.) ..	Dec.	303·8 (9)	182·8	267·5	4·5d.*	7·5d.
Kepong D.	June	66·0 (3)	76·0	407·5	6d.*	3/-
Killinghall	Sept.	266·8 (12)	422·5	422·5	—	—
Kinta Kellas ..	March	130·7 (8)	217·7	286·7	—	1/9d.
Kramat Tin ..	March	98·8 (8)	437·8	621·3	1/-*	6/-
Kuala Kumpar ..	March	1043·3 (8)	963·8	1523·3	—	8/-
Larut Tin	Dec.	267·3 (11)	87·3	119·5	—	6d.
Lower Perak ..	April	967·0 (7)	827·3	1260·5	—	2/9
Malayan Tin ..	June	173·8 (3)	930·5	2751·0	9d.*	2/-
Malaysiam	March	62·0 (7)	67·6	106·3	—	—
Pahang	July	422·7 (2)	430·6	2538·0	—	1/9
Pengkalen ..	Sept.	602·0 (12)	391·5	391·5	—	1/7·5d.*
Petaling	Sept.	1356·3 (12)	1129·8	1129·8	—	4·2d.*
Rahmen H. ..	June	162·8 (5)	127·9	369·9	—	5·6d.
Rambutan	June	54·8 (3)	43·8	233·5	—	1/-*
Rantau	June	329·0 (5)	312·3	799·0	—	3/3·2d.
Renong	June	261·6 (3)	156·0	832·3	—	9d.
Selayang	Sept.	16·3 (12)	118·5	118·5	—	—*
Siamese Tin and subsidiaries	Dec.	2179·0 (11)	2442·0	2681·0	1/6*	2/9
S. Kinta	March	3311·0 (8)	2521·8	3896·8	—	(s) 4/1·2d.
S. Malayan ..	June	271·8 (3)	819·8	3563·5	1/3d.*	4/-
Sungei Besi ..	March	830·8 (6)	913·3	2012·8	1/3*	1/6*
Sungei Way ..	June	474·3 (3)	325·5	1360·0	2·8d.*	7d.
Tanjong	Dec.	664·3 (9)	730·0	959·3	2/6*	4/1·5d.
Tongkah	June	840·3 (5)	755·0	309·8	—	8/-
Tronoh	Dec.	2521·3 (9)	2576·0	3302·0	2/-*	5/3d.
NIGERIA						
Amal. Tin ..	March	2976·0 (8)	3233·0	4808·0	—	1/3d.
Columbite ..		560·0	434·0	722·0		
Bisichi	Dec.	497·0 (9)	438·5	636·5		6·75d.
Columbite ..		400·0	328·0	458·0		
Ex-Lands ..	Dec.	503·0 (11)	495·0	540·0	—	8·4d.
Gold and Base ..	Dec.	732·0	688·0	751·0	3·75d.	3d.
Columbite ..		51·0 (11)	74·0	79·0		
Jantar	Sept.	15·1 (1)	23·5	219·0	—	—*
Columbite ..		44·4	23·6	394·6		
Jos Tin	July	11·8 (1)	13·0	151·3	—	—*
Kaduna P. ..	Dec.	67·0 (11)	70·5	77·5	—	9d.
Kaduna S. ..	Dec.	265·0 (11)	237·0	266·0	—	7d.
Naraguta K. ..	Dec.	58·6 (10)	99·3	116·9	—	—
United Tin ..	March	134·5 (8)	155·5	238·0	—	1·5d.
Columbite ..		8·5	17·5	21·0		
MISC.						
Beralt	March	28·0 (8)	40·0	53·0	—	3/-
Wolfram ..		1413·0	1372·0	2079·0		
Geevor	March	445·0 (8)	430·0	657·0	—	2/6
Rooiberg	June	1134·0 (12)	1103·0	1103·0	3/6*	5/-
S. Crofty	Dec.	788·0 (11)	768·0	856·0	—	—

*Final dividend not declared. †Tons exported. ‡Up to date at time of going to press.
(s) adjusted for scrip issue.